RAILROAD GAZETTE

SATURDAY, SEPTEMBER 9, 1871.

Contributions.

THE FAIRLIE ENGINE.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read Mr. Nickerson's letter in the GAZETTE of August 12th, also your comments on the same. The "complexity" of the Fairlie locomotive is a serious objection to it. The first consideration of railroad managers in introducing machinery on their roads is the first cost; the next, what it will cost for repairs. This last consideration is one that prevents the use of many inventions in railroad machinery. The invention may be a good one, and do all the inventor claims for it, but in practice it is found that the cost of keeping in repairs is far greater than the benefit derived from it.

Mr. Nickerson thinks that the Messrs. Mason "will build engines of this description at a price not exceeding, and perhaps less than that of our present locomotives." Messrs. Mason will do nothing of the kind. The cost of a first-class ordinary locomotive with 15x22-inch cylinders, 54-inch drivers, weighing 27 tons, is from $10,500 to $11,500; a Fairlie engine, the same as the "Janus," cannot be built for less than $20,000.

In repairing the Fairlie there will be double the amount of repairs there is on the ordinary locomotive. "Moving so softly, and yielding so easily," would not prevent the wearing of 24 wrist-pins and connecting-rod brasses, (an ordinary locomotive has eight) four slide-valves (ordinarily two), four links and connections in place of two, eight eccentric straps in place of four, four rock-shafts instead of two, four cylinders, pistons, guides and cross-heads in place of two, twelve steel tires in place of four, two sets of boiler tubes instead of one, twelve steel springs instead of ten (on ordinary locomotive and tender, driving boxes, brasses, shoes and wedges, etc., more than double, and last, though not least, two sets of steam and exhaust pipes. "A "curved steam pipe is more complex than one straight "from the boiler to the cylinder, but its complexity "enables it to yield to the motion, and it lasts longer "with less repairs."

All the old style of locomotives had the **S** copper steam pipes. They were made curved to "enable them "to yield," and prevent them breaking; but they would break frequently; it was a standing job to take down and patch steam and exhaust pipes, and then replace them. They were abandoned and replaced with straight cast-iron pipes. The steam and exhaust pipes of the "Janus" are long and fully exposed to the weather. Steam, in passing through them to the cylinders (also more exposed than in ordinary locomotives) will be condensed, and there will be considerable loss from this cause. The steam pipes and exhaust will both require ball and slip-joints, as the trucks will have both lateral and vertical motion. Joints of this kind in steam pipes are no novelty; they have been made in all shapes; but the expense and annoyance of trying to keep them tight has caused the use of them to be abandoned. Baldwin, Norris, Swinburn and the Manchester Locomotive Works, in their earlier engines, had steam pipes exposed, and of the same construction as those in the "Janus" (the cylinders being fastened to the frames). The plan was abandoned as being impracticable.

The cost of repairs must be fully double that of the ordinary locomotive. The oil and waste account must also be double. There is not only double the amount of machinery to keep lubricated, but if the engine is used on sand or gravel ballasted roads (as nearly all in the West are) the leading engine will raise the sand and dust which will collect in the machinery, joints and journals of the hind engine, cutting them and drying off the oil, and, of course, make a fresh supply of oil necessary. If this is doubted, let any one look at the locomotive on a passenger train, running on a dusty road. The front of the engine will be compartively free from dust, while the tender and tender trucks will be covered one quarter of an inch thick. I have never seen an account of the running expenses of the Fairlie locomotive. It would be of interest to publish these accounts, showing cost per mile run for repairs, stores (oil, waste, tallow and packing), fuel, and wages of engineer, fireman and cleaners.

If I am not mistaken, all the estimates I have seen of the Fairlie's power are made on a basis of the full weight of the engine, including fuel and water. Mr. Fairlie says "The tractive power of a locomotive, as "is well understood, depends on the bite or hold of the "driving wheels on the rails." Now the "hold of the "driving wheels" is governed by the weight carried on them. This weight on the Fairlie and all tank locomotive driving-wheels is a varying one. It appears to me that the power of this class of engines should be estimated from the weight without, or with a small quantity of fuel and water; for as the "strength only "equals the weakest part," so in working these engines the power (weight on drivers) only equals the lightest weight on drivers. In this country the trips—length of divisions or day's work of locomotives—vary from 80 to 150 miles. When the engines start from the engine houses they are supplied with stores, coal for the trip and tanks full of water. The coal is expected to last until the end of trip or day's work. Coal stations are placed only at ends of divisions. From the first turn of the wheels from the engine house the consumption of fuel and water commences, and continues so long as steam is kept on in the boiler. On Fairlie and other tank engines as the consumption goes on the weight is reduced, and it continues diminishing until the supply is exhausted and a fresh supply taken on. Of coal this will not be until the day's work is done. I do not know how much water the Fairlie locomotive tanks hold; a 15 by 22 inch cylinder, 54 inch drivers 27-ton ordinary locomotion, will haul 25 loaded eight-wheeled freight cars at freight speed, from 12 to 15 miles per hour, doing switching, and a tank holding 2,000 gallons of water will supply the boiler with water for 30 miles. The Fairlie with same sized cylinders and four of them will use about the same quantity of water, or, we will say, some 40 miles with 2,000 gallons. We have at the end of that distance 16,000 pounds of the weight (in water) on the drivers gone. As forty miles is a fair average for one ton of coal consumed, we have 2,000 pounds of coal gone. This makes a total weight of 18,000 pounds lost in running forty miles.

Our railroads, fortunately, do not have their water tanks at the bottom of the grades; if they all did, the amount of freight moved per year over them would be considerably less. A heavy freight train stopping at the foot of a grade for water could not in many instances start. Neither could they go back "to take a "run at it," for the chances are that they had just descended as heavy a grade. Water tanks are either on a level or the summit of a grade. On a level they can get started with their trains; at the summit the trains can be started, and also the water replaced that was used in ascending the grade. Locomotives are generally worked to their full capacity in going up grades, therefore the consumption of water is greater. The Fairlie locomotive would be found in many instances on the hardest grades with 18,000 pounds or more of her power gone; and this would be increased as the coal was consumed.

There is another objection to this decrease of weight; that is, in the proper adjustment of the springs, these would have to be made strong enough to carry the engines with a full supply of fuel and water in the tank, or else the frame would rest on top of the driving box and the springs would be of no use. Arranged to carry the engine with full weight, as the weight was taken off the springs would become stronger and more rigid, until the bottom of the box would rest on top of the brace on the bottom of the pedestal, and the elasticity of springs would be lost.

Neither does this engine have the same weight on all the drivers. In ascending grades the back set will have more than the leading; for this reason the water will at the commencement of the ascent flow back from the leading boiler and tanks into the back, and the weight of water flowing back will be added to the back set of drivers and taken from the front. In ordinary locomotives there is frequently a difference of three inches in the water level (at gauge cocks) from the ascending to the descending side of a grade.

There is considerable written by the advocates of the Fairlie about the "jumping and hammering," of the ordinary locomotive. The writers are evidently not in the habit of riding on locomotive engines, or they would know that the said "jumping and hammering," does not exist. The arrangement of springs and equalizers, and the perfect balance of parts on first-class locomotives, are such that the engines ride fully as well as many of the coaches. If the engines do jump the springs absorb the effects and but little of it is communicated to the rail. A locomotive on a good track will roll along at a speed of thirty miles per hour with scarcely a jar. The "jumping and hammering," if there is any, is due, not to the weight or arrangement of parts of the locomotive, but to bad track.

MECHANIC.

The Gazette and the Gauges.

WATERVILLE, MAINE, September 1st, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I cannot resist the impulse to send you my almost unqualified indorsement of the strong and able position taken by you relative to the narrow-gauge mania, which is overrunning the country with its groundless arguments against the present prevailing 4-feet 8½-inch gauge, and mischievious tendency to further multiply the present too numerous variety of gauges, at a time, too, when we were beginning to feel and to remedy the evil of having more than one. Your representations and arguments are simply unanswerable, in the main, and should, it seems to me, suspend action on the part of the narrow-gauge advocates, and set them to thinking, and be the means of inducing them to set about correcting the evil and inconvenience, and so, also, save a portion of the immense expense that a further prosecution of such work must entail upon a future generation. I have watched carefully your course, and that of your opponents—if those gentlemen who have supposed themselves to be discussing and arguing this question in the affirmative can be dignified with the title of opponents—and your articles have been a positive treat to me. I have taken special pains to make use of your thunder in one or two cases, where I knew that parties in whom I had considerable interest were falling into the pits being dug for them by those dealers in false theories and false prophecies, and contemplating the adoption of the system in the construction of their proposed railways, and I have the satisfaction to know that I have warded off the evil in one instance at least.

It seems almost inconceivable that intelligent men, to say nothing of men who profess to be civil engineers, and who set themselves up as advisers to railroad corporations, builders and managers of their railways, should indorse and advocate such baseless theories, in the very face, too, of the inconvenience and expense and delay attending a "break of gauge," and the very general disposition throughout the country to reduce the wide gauges to conform to that one most in use, viz., 4 feet 8½ inches. A uniformity of gauge is now desired, and this need will be felt the more strongly, the more our railway system is developed. There is no doubt but it will become indispensable—an imperative necessity. This State has, I believe, thus far escaped all practical inflictions from this new and strange mania, and her people are about to experience the convenience and economy of having a complete uniformity of gauge, except the single case of a "Winter Branch" from the Canadian railway, which soon will be a matter entirely apart from her general system, as she will soon open independent communication with the West, from Portland directly across the intervening States. I look for further discussion of this subject with great interest, even with anxiety, and shall watch carefully the flow of ideas and conviction in regard to it.

Very truly, yours,

A. L. MORTIMER.

A Ride on a Locomotive.

A correspondent of the New York *Tribune*, who has been "writing up" the Scientific Association which recently held its meetings in Indianapolis, thus describes a ride on a locomotive:

"On the return trip (from Terre Haute) many of the members enjoyed that most fascinating of all modes of travel, a ride on the front of the locomotive. Vice-President Barker laid down only one restriction—that the ladies should not be allowed to try it; at all events, not to sit over the cow-catcher. The wisdom of this restriction was most evident when it happened that there was a cow on the track, it being needful then to get back from the front of the locomotive with cool-headed celerity. Upon a well-ballasted road, such as the Terre Haute & Indianapolis Railroad certainly is, in a prairie country, with good speed, such as was specially attainable upon a down grade, a ride upon the front of a locomolive is the *summum bonum* of felicity to anybody that likes excitement. There is no joy without danger, but the danger is in this case subordinate to the joy. One feels as if he were a meteor driving through space; a missile hurled by a mighty catapult direct at some object in the focal point where the two lines in front of him converge. Bridges rise up to his feet and whirl away beneath him. Cuttings in the hill seem torn open to receive him, widening just before he enters and closing as he passes through. Tunnels open their months as he dashes in, aiming directly at the point of light in front. The world is all behind him; a throbbing fiend is panting close to his back; mere space and a shifting map is in front; and this is not common air that he is breathing, and that thrills every fiber with emotion, it is nitrous oxide."

That man better take something.

—The Boston & Maine Railroad Company advertises to receive bids for the grading and masonry for the extension of its road to Portland about 32 miles, until the evening of the 15th inst.

Contributions.

Boiler Explosions—Are they Periodical?—About Locomotives—Government Inspection, etc.

BY WM. S. HUNTINGTON.

If one will take the trouble to overhaul a file of old newspapers dating back several years, he will notice something singular in regard to boiler explosions. The singularity in question does not rest in the great mystery in which the cause or causes are said to be enshrouded, but in the almost regular intervals at which they occur. The history of boiler explosions reveals the fact that these disasters occur periodically. For several months previous to the Westfield disaster we had scarcely an account of the explosion of a steam boiler until some two or three weeks before that terrible calamity, when all at once explosions were of almost daily occurrence.

Judging from past experiences, we may reasonably expect that the Westfield explosion will end the series of that class of disasters which had followed each other in rapid succession for several days previous to that sad occurrence. If we should not hear of an explosion for several months, and then, of a sudden, have a two or three weeks' excitement over frequent fatal explosions, it would be but a repetition of past experience. The fact that explosions are more numerous and destructive at certain times than at others is no doubt the foundation for the prevailing opinion among a large class of engineers that electricity is at the bottom of all this mischief. A great many argue that at certain periods the atmosphere becomes highly charged with electricity, which acts in a mysterious manner on steam boilers, and that explosions will be alarmingly frequent until this superabundant electric force has been expended, and the mysterious agent has disappeared or become powerless. This belief is probably strengthened by the antics played by this mischievious agent on the telegraphs during some of our brilliant auroral displays.

Our "heftiest" scientific men, however, refuse to accept the theory of electricity being the direct cause of boiler explosions. Perhaps we can propose a more acceptable theory for the cause of the seeming periodical occurrence of a more than ordinary number of fatal explosions. With the thoughts of such a disaster as that of the Westfield, or even one a hundred times less terrible, constantly in the mind of an engineer, he is not very likely to let his vigilance relax. On the contrary, he will increase his watchfulness, and make every effort to discover anything about his boiler that would, sooner or later, lead to a similar disaster. The hundreds of suggestions thrown out as to the cause of explosions immediately after their occurrence stimulate those in charge of boilers to examine those entrusted to them thoroughly, in order to be sure that none of the defects of the boiler or its appurtenances, which have been mentioned as causes of these so-called accidents, may be found lurking ready at any moment to send them to destruction. This excessive watchfulness will continue for several months, while no horrible accounts of explosions appear in the public journals to sharpen the vigilance of those who should ever be watchful. But as soon as the fear that something may be wrong has given place to that recklessness and indifference which is sure to follow a season of safety, the community is again startled by the periodical return of boiler explosions. The care and watchfulness has gradually relaxed for want of that great stimulus, fear. When it is known that a house has burned down through defects in heating apparatus, or any other known cause, every owner of a house in hearing of the affair straightway examines his buildings to make sure that he is not liable to a similar misfortune. When a merchant's or banker's safe is "burglarized", all the safes in the vicinity are examined to see that they *are safe*. But if there had been no fires or burglaries for a considerable time, old stove pipes and rusty bank locks are considered safe. And so it is with the engineer: if there have been no explosions for a time, he considers everything safe, or is utterly regardless whether it is or not. Reference is had here to a certain class of engineers, and it is this class who believe that electricity is the cause of what may in most cases be traced to their recklessness, ignorance or neglect; and this would seem a better solution of the mystery of periodical explosions than that electricity is the *mysterious agent*.

It appears that locomotive boilers do not, like those stationary, of the marine or portable type, explode in concert—so to speak—but "go off scattering." This may be taken as another proof that electricity is not the cause. If boilers were affected by electricity to such an extent as to cause an explosion during the periods when the atmosphere is excessively charged, those of the locomotive should come in for their share, and the explosion of one should be the signal for more to follow immediately, in concert with marine and other boilers. This not being the case, however, we may reasonably suppose it to be due to the better treatment which the locomotive boiler receives. There is not so great a fluctuation in the care of locomotive boilers as in that of other classes. Locomotive boilers are usually in the charge of competent engineers, besides being under the watchful care of the master mechanic, who gives almost daily inspection, and any defect is usually remedied as soon as discovered. Locomotive engineers and mechanics pursue the "even tenor of their way," as vigilant to-day as yesterday, and are not so much stimulated to extra care on the occurrence of a series of explosions as those in charge of other classes of boilers. This constant, regular and thorough care of locomotive boilers may be assigned as the reason for their not joining in the general ruin with those that have a way of being "exploded by electricity." It may be argued from these premises that it is necessary for the public safety to have a first-class explosion occasionally, just to keep engineers awake to their duty; but this would be rather an expensive way of securing what should be had without sacrificing human life, namely: *thorough construction and management of steam boilers.*

The system of boiler inspection—or rather the system of non-inspection—practiced in this country is a mischievous one. When a board of government inspectors pronounce a boiler safe, those in charge of it naturally consider it so, and when any one has a confidence that a boiler is safe he will run a greater risk than if he suspected that something was wrong. It somehow happens that our most terrific explosions occur soon after the boiler had passed inspection and been pronounced sound. It was confidently hoped that when the government took hold of the matter of boiler inspection, explosions would be less frequent and disastrous, but in this we are sadly disappointed. Government inspectors are doing business with the characteristic looseness of all government officials. It would doubtless be an act of mercy if the government would quietly abandon the care or inspection of boilers to men who can see a defect through a pile of greenbacks.

The wealthy steamboat companies, no doubt, would prefer the present system of inspection by government; for as soon as they have an old, corroded shell of a boiler that the public know to be unsafe, they straightway get a certificate of safety from government, which restores public confidence and patronage. If it is necessary to sacrifice a few lives occasionally for the rest of the community, it would be more effectual to hang a few government inspectors with a few steamboat owners occasionally. It would certainly bring sorrow and mourning to fewer homes, and we might soon come to regard an inspector's certificate as something better than the death warrant of hundreds of innocent men, women and children. If the law prohibiting the running of steamboats without a government certificate was repealed, and one substituted obliging all boilers to be insured by a steam boiler inspection and insurance company, it would give us some assurance that our lives are not peddled off for filthy lucre put into the pockets of murderous government agents. The Hartford Company, or a similar institution, should also examine engineers to put in charge of those boilers which they insure and expect to pay for in case of disaster. Let us have better protection from boiler explosions than trusting to certificates of safety from government inspectors.

The Anti-Incrustator, or Porter's Magnetic Battery.

To the Editor of the Railroad Gazette:

The great difficulty of protecting boilers from mineral incrustation, after all the powders and methods hitherto adopted, gives interest to every new device showing partial success in this line.

In the year 1865–6, the American Anti-Incrustator was brought into pretty extensive use. This was an instrument in the form of a brass disc, or palm, as large as a man's hand, furnished with seven magnetic steel points projecting two or three inches, radially, from the margin. This was inserted by insulated connection in or near the steam dome or drum of the boiler, and a copper wire was carried from its handle to the farther extreme of the boiler and there secured to a brass post, whose point protruded through the boiler wall and projected three or four inches in the open air. The points were supposed to collect the free electricity from the steam, and to carry it back through the steam chamber of the boiler and discharge it into the open air. My additional impression, derived from the effects, was that the entire wall of the boiler under water, and the flues, had their magnetic condition reversed, changing the attractive crystalizing force, ordinarily exerted by steam upon these surfaces, into the opposite, decrystalizing and disentegrating force.

The undersigned undertook its introduction in Texas, and with a success not invariable, but in most cases very satisfactory. The exceptions to success—the first in the boilers of the Factors' Cotton Press, and the second in the steamship Crescent, of the Morgan Line—were so marked as to convince me that the company, with Professor Cresson, a philosopher in mechanics, at its head, did not understand their own instrument, and that my own explanations of its remarkable results in loosening and disintegrating the most flinty scale were defective. I abandoned it as not entirely reliable, though generally successful.

In the case of the cotton-press boiler, I changed the position of the battery twice, and the feed pipe once, in order to get all the currents coinciding; but the result appeared to be to accelerate the formation of scale, and the apparatus was taken out. In this case, three days' active use of the steam destroyed the magnets entirely, exfoliating and defibrating the solid steel points that went in perfectly silvered and pointed.

In the case of the Crescent, in which the Chief Engineer, Mr. Turner, took an active and intelligent interest in the experiment, the experience was similar. The four batteries applied to the boilers working a 350-horse-power engine were changed twice—once inserted in the steam drum itself—and yet the failure was palpable. The points were rapidly destroyed and the scale formed with new activity.

These cases are contradicted by so many successes in locomotives and stationary engines, under my own and other engineers' experience, variously published by the company and by myself, as to need no further statement.

It is, however, worthy of remark, for the sake of the apparent paradox, that in the Planters' Press boiler, whose success was complete, the boilers and fixtures were so like the Factors' Press as to make the opposite results utterly baffling. Not less so was the contrast between the Hewes, of the Morgan Line, and the Crescent. In the Hewes (whose engineer, Mr. Waring, had great faith in the battery), the effect was immediate and continued, and soon so loosened and broke up the enormous scales that had covered and patched the worn-out boilers as to spring leak after leak, and to demonstrate the necessity of condemning and replacing the entire system of tubes. The scale was one-half to two inches thick, and weighed tons. It was greatly broken up by the battery, but could not come away. The ship was then furnished with a refrigerator, rendering all such instruments unnecessary.

This article was prompted by the reception of the document below, from one of the oldest and most reputable mechanics in the country, a man of forty years' labor in the machine shop and engine room. It speaks for itself:

MACHINE SHOP,
GALVESTON, HOUSTON & HENDERSON RAILROAD,
GALVESTON, TEXAS, July 13, 1871.

To whom it may concern:

I make this statement for the benefit of the public; also for the credit of Colonel Forshey, who introduced the American Anti Incrustator.

He caused the instrument to be placed in the boiler at this shop, after the flue collapsed, caused by incrustation and overheating. The new boiler was introduced, and by blowing off frequently as instructed, to change the water and discharge sediment, we have had neither trouble nor detention to clean out our boiler in all this time—more than four years.

I would earnestly recommend the use of the battery in every boiler.

(Signed) R. W. WILLOUGHBY, Engineer.

Believing that the philosophic principles involved in the phenomena of these experiments should be better mastered and utilized, I invite the attention of engineers and electricians. C. G. FORSHEY, C. E.

GALVESTON, July 31, 1871.

The Eastern Railroad Disaster.

The lesson which this great tragedy teaches to railway managers should not be forgotten. The facts are simply as follows: A local or accommodation train was started a full half hour after its time, and was followed by an express train ten or fifteen minutes later. The local train made several stops for the leaving of passengers, and was otherwise detained for some time by waiting for a branch train to get out of the way, so that at Revere, fifteen miles from the Boston depot, the express train ran into its rear, killing some thirty passengers, and wounding a large number besides. The public are now discussing the question as to where the blame belongs for this terrible tragedy. Undoubtedly a certain amount of blame belongs to the engineer of the express train, whose duty it was, if he knew that a belated slow train was ahead of him, to feel his way along slowly, so as to avoid running into the rear of the train ahead, a rear collision being notably the most disastrous of all collisions. In not doing this, he neglected the great "rule of safety," the rule, we beg

railway managers and employes to understand and remember, that it is their duty never to forget. Did the engineer of the express train know that a belated, slow-moving train was ahead of him? The conductor knew it, but did not inform the engineer. Did any one tell the engineer of it? If he knew it, then he committed wilful murder; if he did not know it then the train dispatcher, or some officer of the road at the Boston depot, had neglected his duty. The evidence before the coroner's jury shows that the local train was detained several minutes, waiting for a train on a branch line to pass, and yet the officials of that train did not send back signals to warn the express train of the detention, showing an amount of carelessness exceedingly reprehensible, and deserving of severe punishment. The great "rule of safety" was violated in both cases, and by both sets of train officials. The relative amount of responsibility for the disastrous results cannot be accurately determined until the inquiry now being held is finished.

But there is still another side to this question of responsibility. For the fortnight preceding the disaster the traffic of the road has been exceptionally large, in consequence of a camp-meeting and a muster being held near the line, and a scarcity of rolling stock made it impossible to make up the trains so that they could start upon time. We have it from the public press and from passengers, that detentions of the regular trains were frequent, and the consequence was that the trains were run without regard to the time-tables, thus entailing a confusion and *want of system* that invited disaster; and here the responsibility comes upon the management. The time-tables of a road situated like the Eastern, with its many trains of mixed and heavy traffic, cannot be disregarded with safety, without the trains are run with the aid of the telegraph, and we understand that telegraphic facilities are not to be found upon the line except at the larger stations. With telegraphic aid it is comparatively safe to run trains independent of the time-tables; without it, the attempt wilfully invites danger. Every line of like importance to the Eastern should have a well-arranged telegraphic system, like that in use on the Camden & Amboy, and other roads, so that it would be impossible for one train to approach within dangerous distance of another. The management of the Eastern road, by running its trains out of time, and by not properly cautioning the train hands, disregarded the golden rule of safety, and thus disaster follows. They had been "trusting to luck" during a season when the road and rolling stock were heavily tasked by an excess of traffic, and at the last moment "luck" failed them. The terrible result will not easily pass from the public mind, and the lesson must not be forgotten by railway managers and railway officials. We have written coutiously upon this matter, taking the facts as given to the public by the press, and the evidence before the jury. But we shall have something more definite to say when the record is full and made up, distributing the full blame and responsibility where it rightly belongs.—*American Railway Times.*

Practical Working of the Bonded Car System.

Under the provisions of the tariff and internal tax act of July 14, 1870, Congress voted to certain interior cities on the coast that are either not furnished with facilities for the proper transaction of trade with foreign countries or desire a more direct communication overland, the privilege of importing goods in bond direct through other ports, without delay for examination and appraisement at the original landing. Those cities are as follows:

New York, Boston, Providence, Philadelphia, Baltimore, Norfolk, Charleston, Savannah, New Orleans, Portland (Me.), Portland (Oregon), Buffalo, Chicago, Cincinnati, St. Louis, Evansville, Milwaukee, Louisville, Cleveland, Memphis, Mobile, San Francisco, to and from Europe and Asia, and the islands adjacent thereto *via* the United States.

In framing the part of the law relating to this subject, Congress seemed at the time to be actuated solely by a desire to accommodate the cities of the West, and went blindly forward without a well-considered method of operation. The new legislation is an experiment, and while the law contains many incongruities, impracticabilities and blunders, it is also characterized by a number of omissions which are now quite noticeable.

With the law for a basis, the Secretary of the Treasury, to whom the power was delegated, directed his experts to prepare a series of regulations for the government of the new system. After they had prepared them, the Secretary and Assistant Secretary revised and corrected them until they believed they had done the best they could to make it successful as a system, convenient and useful to the merchants, and safe for the government. But the whole thing is new. No expert has confidence in results, and in fact every one of them has predicted that the law would prove a failure. The main point to be covered was in the distinction between the old and new systems. Under the old plan goods could be sent in bond to points within a collection district, but the entire vessel or car freight was placed under government supervision. The new plan was intended to exert a supervision only over a space necessary to carry the amount of bonded goods to be transported, a part of a vessel or a part of a car, where a full load of goods were not bonded.

The safeguards for the protection of the government were to originate with the Secretary of the Treasury, and his regulations were to be clothed with full force and effect of law. His imaginative mind conceived the idea of appointing an army of inspectors, with generous salaries, to be paid by the railroad companies. Special iron cars were to be made for the purpose, and a lock was to be placed wherever there was room to nail a hasp. A patriotic band of brothers were to supply [the great] "American seal lock" for each crack where a robber could peep through, at a liberally remunerative cost, to be paid by the railroad companies. Intricate machinery for vigilant inspection at each way station, and expenses and drawbacks to success marked the body and seemed the pith of each paragraph in the regulations. Bonds that were stronger than the cars themselves were to be given for the performance of the contract by the fortunate parties who were to become "common carriers" within the spirit of the law and the distinct terms of the Secretary's regulations.

The caution with which transportation companies approached the scheme, and the rapidity with which they went away, reminded one of fish nibbling at a hook. The first bait did not answer. Some three important railroad companies came forward and the Secretary thought they would bite, but nine months elapsed and not a single transportation company in the United States agreed to comply with the terms. It was then discovered that the conditions were too stringent. The Secretary trimmed the regulations, allowed railroad companies to use ordinary box cars, and reduce the number of locks required to two for each car. He also reduced the number of inspectors, gaugers and other officers to a limit where necessity placed it. Where in crossing a river it becomes necessary to transfer the cars of goods to a steamboat, a more liberal system of transfer is now addressed to that particular emergency. Measures for facilitating the delivery of goods from ocean steamer to common carrier have been taken, and the details are being arranged to make the whole experiment successful in accomplishing its object, so far as the meagre and incoherent provisions of law will permit.

Since these amendments to the regulations have gone into effect, two railroad companies the Camden & Amboy and the Merchants' Dispatch Transportation Company—have accepted the conditions, executed their bonds, and are now carrying goods under the system. The Camden & Amboy Company operates only between New York and Philadelphia, but has been carrying bonded goods for several weeks. The Merchants' Dispatch Transportation Company operates from New York to Boston, Providence, Portland (Me.), Portland (Oregon), Buffalo, Chicago, Cincinnati, St. Louis, Evansville, Milwaukee, Louisville, Cleveland, San Francisco, Memphis, Mobile, and from and to Europe and Asia and the islands adjacent thereto, taking through invoices across the continent. By their mode of operations they take goods off the steamer and send them part way to destination the same day they arrive from a foreign port. They are exempt from warehousing, cartage charges, examination and appraisment, weighing and measuring, gauging, and general order. The Merchants' Dispatch line has just received 1,000 new cars, specially constructed for this business. It is said that they are as fine and substantial a set of box cars as have ever been built anywhere. This company believe the bonded transportation system will be a perfect success, and the fact of their having bought at once so many cars, looks very much like abiding faith in the enterprise. It might be remarked that J. C. Fargo, Augustus Schell, Wm. H. Vanderbilt, Horace F. Clark, Jared Chittenden and others of the New York Central Railroad Company are the corporators of the new company, and it is believed that the Central folks are really the new concern.

It is probable that the Pennsylvania Railroad will bond. That will depend greatly upon the success or failure of the other line to make it pay. If the present efforts are successful the competition between the Pennsylvania and New York Central will be quite lively. The Erie Railway cannot bond with profit, for the reason that at each change of gauge the goods must be changed from car to car under the supervision of government inspectors, who are paid by the company. Thus, in shipping a through carload to Chicago, it would go on a broad-gauge road to Buffalo, then strike a narrow-gauge road, and at Cleveland would again meet the broad-gauge. It would probably require the continuous services of eight industrious goverment employes at those two breaks, at an average salary of $2,000 each, aggregating $16,000 per annum, which would cut deeply into the profits. But the Erie road is not at all anxious to go into the business at present.

THE TEA TRADE WITH CHINA AND JAPAN.

Mr. Webb and Mr. Holladay expect great things to come from the new through European-Asiatic transcontinental traffic. Arrangements have been made whereby tea will be put down in San Francisco from China and Japan by the shortest sea route that can be found. Experiments have shown that tea does not absorb enough extra moisture to injure it on the twenty-two days' trip to San Francisco, and that in its passage east over the Pacific roads the rarefied atmosphere of plains effect a change that restores it to the perfect condition in which it left China. If it is a fact and not a theory of imagination that these greatly desired results are reached in the passage, it will be a decided benefit to the Pacific Mail steamers and our trans-continental trunk roads. A new aid will be furnished to the central trans-continental route, and competition created between that and the Southern Pacific, which will tend to reduce through freights, while benefiting not only the roads themselves, but also the localities through which they pass. It may be interesting to know that the Pacific Mail steamships are now driving a brisk trade, both in freight and passengers. An Austrian nobleman, a tourist who passed through from Japan to Austria by the American steamers and railroads to New York, says emphatically that the road furnishes better facilities and more comforts to the passenger, besides the grand sites seen on the trip, than any route in the world, and that no route between Europe and Asia can compare with it in respect of quickness, comfort, convenience or enjoyment to the passenger. He told President Grant he would publish the fact throughout his country and all parts of the world he may hereafter visit. When foreigners become enthusiastic over our travel system, we have great reason to be proud of our achievements, and to believe that the Asiatic trade, for which we have contended so long, will soon be transferred to our merchants and carriers.

THE SEAL LOCK BUSINESS.

The Merchants' Dispatch Company complain that the Secretary of the Treasury has ordered them to put two "American seal locks," at a cost of $16.30, on each of their 1,000 new cars. The first train for the West went off some days ago, locked as ordered. The company do not like the locks, and think that if the Secretary of the Treasury admires them so much the government ought to pay for them, and not force the companies to do it, to pay a bounty to the "lock ring." As another instance of this injustice, petroleum exports furnish a startling exhibit. Petroleum costs about $50 a car load at the oil wells, and the freight to the seaboard costs about the same ($50). Thus it will be seen that half the value of petroleum in New York is made by freight charges. A great deal of it is carried in bond through the border of Canada and back into the United States by rail to New York. Secretary Boutwell has ordered that each car be locked with an American seal lock at $22 per car. In view of the fact that all the companies have any quantity of the old shackle seal locks that have never yet been picked (except by collusion among the government officials), which never wear out, and were furnished at a cost of 50 cents each, this imposition on the petroleum exporters is a very suggestive fact. The exporter of petroleum finally pays for the locks in increased freight charges, and the natural effect of a few more such impositions would be to divert trade in petroleum through Canada to Europe, instead of through New York. The lock exaction itself will send many a cargo down the St. Lawrence River, to the unnecessary injury of New York.

In establishing safeguards for the protection of the government there are three considerations to be taken into account:

First—Character of transportation companies. Thefts on the part of a tranportation company would result in their own loss. They are obliged to pay the owner the value of the goods, and to pay the government the amount of duty. While the government has an average interest of 35 per cent. in the goods being transported in bond, the transportation company have an interest of 135 per cent. in the same goods, besides the reputation of the company, which is always at stake. No transportation company in this country have ever been known to steal bonded goods. The care of the government then must be exercised to prevent the possibility of exchange of packages. If a system or single act of exchanging, for example, *fac simile* packages of toys or straw, for a package of silks or velvets were undertaken by the company, the act would require collusion of the owner with every officer of the company, from the president to the brakesman. The conclusion then is, that transportation companies are necessarily, and in fact, honest, so far as smuggling is concerned.

Second—Safeguards against robbers. Every officer and employe of the transportation company is a watchman against robbers. So should the government officials be. But when a robber comes along he quickly jerks the hasp out with a "jimmy" and the lock drops down intact, leaving a free entrance to the car through the door. He would not even stop to unlock a common pad-lock requiring an ordinary key, or that could easily be opened with a nail. Therefore, no car lock is a safeguard against robbers.

Third—Collusion among government officials. The only manner in which the present government locks have been picked within the many years of their past use has been through collusion between government officials. The seals have been put on and taken off and goods removed and replaced by similar looking packages, and the seals on the locks restamped. Therefore, the danger in the case is from the men sent by the government to guard its interests. No lock in the world could prevent collusion among the men who hold the keys to it.

PROBABLE EFFECT OF THE NEW SYSTEM IN NEW YORK.

Opinions differ about the probable effect of the new system of bonding goods without appraisement, from seaport to seaport or to the Interior. Many merchants of the Interior say they will not make use of the privilege, for the reason that they are obliged, in any event, to patronize New York in buying gold for payment of duties, and the cost of transporting gold is about equivalent to the broker's fee; while the only advantage gained is in avoiding delays here in Custom House business that is done more quickly in cities where there is less of that business transacted. The special government agents on this forwarding business, paid by transportation companies, take an entry at once and watch the goods from steamer to depot, thus getting them off to final destination the same day they arrive. They avoid the three or four days delay here, and the same work is done in one, two or three days at the port of final delivery.

This forwarding will take from New York some business of Custom House brokers, appraisers, inspectors, weighers, gaugers, warehousemen, draymen, general order stores, and others. And some of our merchants contend that it will encourage direct purchases between the West and Europe, thus injuring their trade in some degree. The friends of the scheme say the advantages to New York to be gained by opening an Asiatic-European trade across our continent will more than make up for the possible losses in other ways. They contend that every shipment must benefit in greater or less degree the cities of New York and San Francisco, and that considerable handling will be necessary at both those points. They further argue that New York will be certain to receive the freights destined to ports along the Mississippi River whose foreign supplies have heretofore reached them from New Orleans. The landing of the vessels and emigrants is much to a city in a commercial point of view. Whether these predictions, or any of them, will prove true is a matter of conjecture. A few weeks will probably determine the success or failure of the enterprise.—*New York Journal of Commerce.*

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the Railroad Gazette, *if not previously published,* free of charge. *They are invited to send us drawings or models and specifications. When engravings are necessary, the inventor is expected to furnish his own engravings, or to pay for them.*

Engineering and Mechanics.—Mr. M N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent.

THE MASTER MECHANICS' CONVENTION.

By the time this number of our paper reaches the majority of its readers, the Convention of Master Mechanics will be in session in Louisville. There is therefore little to be said, excepting some general words of criticism based upon the experience of past meetings, with perhaps a suggestion here and there for the consideration of the members at the time of their assembling together.

The last meeting in Philadelphia was attended with two very marked evils which can easily be overcome, but which are nevertheless serious obstacles in the way of the usefulness of the Association. The first of these is the indiscriminate amount of eating, drinking and pleasure-seeking which was indulged in through the hospitality of some of the Philadelphia people. It, of course, is absurd to say that because the members of these meetings partake of good dinners that they will therefore not attend to the legitimate business, or give proper attention to the subjects for the consideration of which the Association was organized. It is true, too, that much injustice has been done to the Association by the making of such inferences; but, nevertheless, the Association has suffered by the spread of such reports, and in some instances it has a reputation which it does not deserve, but which, nevertheless, has been injurious to it. The remark is often made that the members attend these meetings to have a "good time," which, if true, would not be very extraordinary nor very culpable, because there is no reason why master mechanics should not have a good time at least once a year; and if they eat good dinners and enjoy themselves—in moderation—neither they nor their employers will be any the worse for it. There are, however, a class of people who never can see or hear of any enjoyment in which they have no part without a manifestation of envy or ill nature thereat. Because the members are hospitably entertained is no reason why they will not be able to keep their "heads level," and give the proper consideration to the subjects which come before them. Nevertheless, such reports as we have referred to are bad, and have an injurious influence on the reputation, and, we believe, on the influence of the Association, and by a very little restriction in this direction the evil could be entirely removed and the good name of the society be unimpaired by this cause.

The other evil to which we referred is the occupation of the valuable time of the Association by business of very little interest to the members, and which engages their attention to the exclusion of other important matters. A great deal of such business could be transacted by a committee in much less time and more satisfactorily than by the Association. We would therefore suggest that some sort of an executive committee should be appointed, to whom all new business, correspondence, etc., should be referred, and who should determine whether such matters were proper subjects for consideration by the Association itself, and also have authority to act upon the less important business. Such a committee might consist of the President and Secretary, with perhaps five other members. The correspondence would thus all come before them for consideration, and much of it could be acted upon, thus saving a great deal of valuable time to the Association. As this committee would be the most important one of the society, therefore the members of it should be elected, and at the same time some measures should be adopted whereby a minority of the society could always have one or more members on it to represent them. This could be accomplished by electing them in the same way as is provided in the new Constitution of the State of Illinois, *i. e.*, allow each member of the Association to cast five votes, with the privilege of giving them all to one person or of distributing them among several, as he might choose. By this means it would always be in the power of two-fifths of the Association to elect two members of the executive committee, and thus be represented in it, and in this way keep it out of the power of any clique or "ring" to control matters in their own way without the knowledge or criticism of those who think differently.

Such a committee would transact much of the business of the Association, or else put it into a form most suitable for the Association itself to act upon.

The following are the subjects for discussion at this year's meeting:

Boilers and boiler material.
Steel tires, wheels and axles.
Boiler incrustations.
Boiler explosions.
Dead weight of rolling stock.
Construction of furnaces.
Lap and lead of slide valves.
Style of engine for freight service.
Practicability of placing indicators upon engines.
Application of compression brakes.
The merits of steel for links, guides and crank pins, as compared with the best quality of iron case-hardened.
The proportion of the surface of the water in the boiler to that of the heating surface to insure the best results.
Journal, cylinder and machinery oils.
Safety-valves.
Cylinder and stuffing-box packing.
Uniform size and thickness of tires and wheel centers.

Several of these subjects at once strike the reader as having at the present time especial interest. That of boiler construction is one which considerations of humanity, if none other, should induce every member to study as earnestly as he has capacity or time to give to it. There is no part of locomotive construction in which there has been so little improvement as in the boilers. Special machinery has been made for manufacturing nearly every other part, while in the construction of boilers the same appliances are still used that were employed twenty-five years ago, and the same rude means for fitting the parts together that were in use then are depended upon now. In all the other parts of machinery, where great strength is required, they are fitted with the greatest accuracy, but thus far very little apparent effort has been made to secure accurate workmanship in the manufacture of boilers, where it is of *the most* vital importance. Dependence is still placed upon rude wooden templates, or the rougher means of laying off with dividers. When rivet-holes do not correspond, a murderous drift is driven into them to force the plates together, or the holes are reamed out until they are too large for the rivets, and thus the latter often do not fit.

Now what is much needed in boiler construction is some thorough system of accurate workmanship. In every other department of engine construction there are gauges and special tools to insure the most exact fitting. It is difficult to see why some analogous system is not employed by boiler-makers as well as by the machinists.

It is very much to be desired that some discussion should be given to the question of the relative strength of the punched and drilled plates; and if some of the members who have facilities for testing the strength of such plates would make experiments of this kind they would be doing what would be very much better than theorizing on insufficient grounds.

With reference to the dead weight of rolling stock, we think it would have been wise had the subject been divided, so that the weight of cars and engines might have been considered separately. The conditions which limit it in the one case are entirely different from those in the other. The discussion of the narrow-gauge question is stimulating this inquiry, and the advocates of the new system have at least set forth in very strong light the advantages of a reduction of dead weight, if they have done no other good. At the last meeting this topic was passed over without discussion, which it is to be desired may not be the case this year.

"The best style of engine for freight service" is another subject which should call out a great deal of comment. There is certainly sufficient diversity of opinion in relation thereto to afford a full day's discussion. We renew our suggestion made last year, that some consideration should be given to the question whether the weight of water and fuel can profitably be employed for creating adhesion on the driving-wheels. Several forms of tank engines are now on trial, and have been presented to railroad companies for their consideration. On some of these the water and fuel are carried on the driving-wheels, while on others they are carried on a truck. Advantages are claimed for each plan, and it would at least be interesting, if not profitable, if the master mechanics should consider the merits of each in a public discussion.

There is one other suggestion which we venture to present for the members' consideration, which is, whether it might not be wise to admit as associate members persons whose qualifications would make their advice and comments valuable in the deliberations, but who are not engaged as master mechanics on any railroad. There are a great many engineers and scientific men who are deeply interested in the subjects which each year come up for consideration, and who, if they could be heard, would be able to contribute information such as persons whose entire time is employed in the active and absorbing duties of railroad management have not the opportunity to acquire, and which relates perhaps, to such branches of their profession as they have no means of investigating, or time to study. The branch of chemistry is an example. At the present time we know of no member of the Association who has any considerable amount of knowledge of this science, and yet there are continually arising questions, such as relate to the analysis of oils, the deposit of scale, the change in metals by use and exposure, the combustion of coal, and many other questions, on which there is little doubt that any able chemist might throw much light. We speak of chemistry because it is a good illustration of what we mean. There are other branches of science of very little if any less importance, such as the higher mathematics, electricity, dynamics, etc., in which persons who have made these sciences a specialty might be of immense service, by contributing of their information, and, so to speak, illuminating the subjects discussed.

We are aware that the Association might—unless it protects itself—run some risks and be "demoralized" by the admission of interested parties, who might use their positions for the purpose of grinding their own special axes. To guard against this evil, associate members might be allowed to take part in the discussions, but none but master mechanics be permitted to vote; and in the election of associate members it might be provided that three dissenting votes should defeat their election. The vote should, of course, be by ballot. In this way undesirable members could always be excluded.

There would be another advantage in having such persons associated with the society. In many instances scientific people have leisure for experimenting, but have not the facilities for doing so, which could easily be afforded them in any railroad repair shop with little if any expense. By co-operating with practical men, their experiments would of necessity be directed into elements which would be useful, instead of having a mere vague scientific interest. Take for example the purification of water. We do not doubt that if there were half a dozen able chemists in the Association, who should turn their attention to and study this subject, that within a year they could at least partially overcome the evil of impure feed water, and thus save thousands of dollars to each of our railroad companies.

The Association can, of course, not be too jealous of the admission of all sorts of wind-bags and "bummers," whose special vocation in life is to sharpen their own implements while the rest of mankind are employed in turning the grind-stone. There is so much shrewdness, however, among master mechanics, we think, that whenever a person not specially qualified for membership is presented, there will always be at least three men who will see it, and defeat his election.

One other thing it might be well to say: If there is any speech-making outside of the business meeting, don't let there be any bosh about the star-spangled banner, our glorious country, or any other spread-eagleism whatever. That sort of talk every one knows

is humbug, and it is no more necessary to tell the master mechanics at such a time that they should honor and respect their own country and its flag than it is to enjoin them to observe the ten commandments.

General Butler's Opinion.

We publish elsewhere a part of a speech made at Lynn, Mass., by Gen. Butler, who is going about in that State seeking to secure a nomination and election as Governor of Massachusetts. What he says is very forcible, and has much of truth in it, and yet underneath all is woven, in the most ingenious way, a texture of folly which, unless we greatly underrate the intelligence of railroad employes, they will discover and estimate at its proper value.

That a locomotive engineer should have intelligence, courage, coolness, nerve, presence of mind, keen eyesight, and watchfulness which never slumbers, is doubtless true, and that they are often underpaid is also true; but to say that they "require more of the high qualities "with which God may endow a man than are neces- "sary in the Governor of a State," is unmitigated nonsense, and means that General Butler, by such absurd flattery, hopes to get the support and votes of the people whose intelligence he thus insults. That a man with very little courage *might* occupy the position of Governor of a State may be true. If it were not, it is doubtful if General Butler would present himself as a candidate for that office; but to govern wisely, requires not only all the high qualifications which he attributes to locomotive runners—and which we know they possess—but much more besides. A governor must not only be brave, fearless, temperate and watchful, but he must have a knowledge of all the complex relations existing in society, have unflinching integrity, and—what is perhaps one of the rarest of traits—have an instinctive sense of justice, the result of a combination of the highest moral and intellectual characteristics.

To say that an "engine driver who fails" in any of the qualities named "may do more damage and cause "more loss of life and property than the Governor of "a State," is to lose sight of the fact that both the civil and military powers are to a great extent subject to the command of the latter. The amount of evil which General Butler might do as Governor is perhaps impossible to estimate; but if we measure his capacity in that direction by his incapacity at Great Bethel and Fort Fisher, we do not believe that the incompetence of any locomotive engineer could be more disastrous. We believe that locomotive runners are entirely too sharp to be caught by such absurd flattery as is heaped upon them by the man who is seeking their votes. They know that running a locomotive is one thing, and governing a State quite another; and that because a man understands the complications of valve gear it by no means follows that he knows all about jurisprudence, political economy, and social science.

General Butler is quite right in saying that the law should provide a certificate to competent engineers and prohibit the employment of incompetent ones. But, reader, have you ever reflected how exceedingly difficult it would be to determine who is competent and who incompetent? How could you tell, for example, whether a man would stick to his engine or not if he saw a danger signal ahead or a draw-bridge open? No examination could determine that, and General Butler knew he was talking nonsense when he said what he did, but supposed that very few people would see it.

When he says that locomotive engineers should receive the pay of superintendents, and superintendents that of the engineers, he is capping the climax of his absurdity. A man to superintend or command must know more than those he is to direct. It is true this was not so in General Butler's case, during his military career, but fortunately it is nearly always true of the management of railroads. The best man should govern, and he should also have the highest pay; and in this latter respect, we think, is the great injustice done to locomotive engineers. They are rated too much alike, and not sufficient difference is made in the pay to those who have had a long experience and given faithful service, over those who are young, inexperienced, careless and incompetent. If they were divided into, say, half-a-dozen classes, and *the best* of them were to receive double the pay they do now, and promotion were made competitive, we are satisfied that the service would be immensely improved, and the companies so doing would be repaid, thrice over, the additional amount thus expended.

When General Butler, however, says that the conductor, the fireman, the engineer and brakeman should have the highest salaries on the road, he is saying what all persons in such positions, of any common sense at all, know, as well as he does, is utter nonsense.

Cost of Fairlie Locomotives.

In an article on the Fairlie engine, published on another page over the signature "Mechanic," the writer misapprehends, we think, the question at issue between ourselves and Mr. Nickerson relating to the cost of Fairlie engines. It is not whether with two sets of 15x22 cylinders they will cost more than an ordinary engine of the same dimensions, but it is whether a Fairlie engine *which will do the same work* as the common eight-wheeled American engine with 15x22 cylinders will cost more. Of course with four cylinders and more weight available for adhesion they need not be so large to do the same work as the two must be on an ordinary locomotive. We trust, however, Mr. Mason will set the matter at rest by stating the cost of an ordinary 27-ton engine and tender, and a Fairlie engine of the same capacity.

Errata.

In Mr. Louis Nickerson's letter, published last week in the RAILROAD GAZETTE, there were two considerable errors. Beginning in the eighth line of the fifth paragraph, it should read "In those days complexity was a "mental and mechanical impossibility from which the "mind recoiled. With the wisdom of our ancestors, "we have gathered, clinging to it, some of their weaknesses," etc. The word "complexity" being substituted for "complicity" in the first sentence, and "ancestors" for "masters" in the second.

MISCELLANEOUS.

—Mr. W. H. Hunt, of Liberty, Me., has been chosen President of the St. George's Valley Railroad Company.

—A coroner's jury in Indianapolis, at an inquest on the body of a man killed by a locomotive, returned a verdict censuring the engineer and fireman, who, it is said, will be arrested.

—The telegraph says that Isaac Rosenzweig, a prominent and wealthy citizen of Erie, Pa., was convicted, on the 31st ult., of selling forged tickets for passage over the Erie Railway.

—Governor Baldwin, of Michigan, advertises that the St. Mary's Falls Ship Canal will be closed for repair and improvement at noon on the 25th of November next, and will remain closed until May 1, 1872.

—The boiler of a locomotive on the Toledo, Wabash & Western Railway exploded on the 1st inst., killing the engineer and fireman. No clue to the cause has been discovered—at least none has been reported.

—The Portland *Press* says: "It is a singular fact, since railroads were built in Maine only one passenger has been killed by a railroad accident properly so called, and that was Mr. Gallagher, who was killed in the crash through the bridge near Bangor. This is certainly a very small percentage of passengers. We do not, of course, include accidents to persons who have been run over or who have attempted to get on a train when in motion."

—The *Iron Age* says: "Lancaster, Penn., is the first city in the United States to put an underground railway into practical operation. It is not so large as the Metropolitan, of London, but serves its purpose, and is due to the energy of one manufacturer entirely. The railway in question is in a tunnel running between the cotton mills Nos. 2 and 3 of Mr. John Farnham, of Philadelphia, the sole proprietor of these mills. This tunnel connects the tower of mill No. 2 with that of No. 3, and runs under Prince street, a total distance of 180 feet in length. It is intended to economize labor and expedite the transmission of goods from one mill to another. For this purpose a railroad is laid in the tunnel on which a platform car will be run. The tunnel is arched with brick, is seven feet high and six feet in width, and, as above stated, 180 feet in length. A great convenience in the handling of goods will thus be afforded by a little engineering skill. The mills connected by this underground railway employ no less than 900 hands, including men, women, and children."

—The Green Bay *Advocate* of August 31st says: "Captain Wm. T. Casgrain was in town on Wednesday on his way to Sturgeon Bay. Captain Casgrain is the engineer who has made the recent resurvey for the Sturgeon Bay Ship Canal, on the part of the government, under Colonel Houston. Briefly, the state of the work is this: A survey of the route was made by J. E. Thompson, in 1867, the timber cut out and borings made. Some rock, probably boulders, was found, and there were two angles in the survey. Application was made to Congress for an additional grant of land to aid the company in building the canal, on the supposition that there was rock, which would increase the cost of the work over the first estimate. Congress instructed the Secretary of War, at the last session, to cause a new survey to be made. Captain Casgrain has accordingly resurveyed the old route, and, also, a new one. The latter is the most direct connection, and a straight line from the head of Sturgeon Bay to the lake; is one-eighth of a mile shorter than the first route; is free from rock, and more advantageous in every respect. A company of gentlemen, officers of the company, among whom are William B. Ogden, I. Stephenson, and Joseph Harris, will examine the routes next Saturday with a view to the selection of the most feasible, and work will probably commence immediately, and the dry excavations be made this fall and winter. The length of the new route, from deep water to deep water, is about one and three-quarter miles."

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—W. S. Baldwin has been appointed General Traveling Agent of the Lake Superior and Mississippi Railroad, with headquarters at St. Paul.

—Alfred B. Farnsworth, for many years Passenger Agent of the Lake Shore & Michigan Southern Railway at Cleveland, has been appointed Eastern Traveling Agent of the Toledo, Wabash & Western Railway, in place of W. H. Firth, resigned. His headquarters are at Toledo.

—S. H. H. Clark, who has been superintendent of a division of the Union Pacific Railroad since its completion to Laramie, has been made Assistant General Superintendent, retaining charge of the Eastern Division, from Omaha to Cheyenne.

—Articles of association of the Lockport & Buffalo Railway Company were filed on the 30th of August. Information of the projected line, from Lockport to Tonawanda, was given in the RAILROAD GAZETTE of September 2. The directors are: Hiram Gardner, Benjamin H. Fletcher, Thos. T. Flagler, Silas H. Marks, Jas. Jackson, Jr., Benjamin Carpenter, Robert Dunlap, Levi H. Bowen, John Hodge, Josiah H. Helmer, Elisha Moody, Joseph A. Ward and Josiah L. Breyfogle, all of the city of Lockport.

—Some of the stockholders in the Dubuque, Bellevue & Mississippi Railroad Company claim that recent actions of the directors are illegal, and they lately held a meeting in Bellevue, Iowa, to "fill vacancies" in the Board. The following named persons were elected: Thomas Finn, John Baumann, Wm. A. Maginnis, D. A. Mahony, M. J. Finn, E. H. Porter, Eugene Finn, John C. Hughey and Robert M. Hughey. This election was held on the assumption that the acting officers of the Dubuque, Bellevue & Mississippi Railroad have no right to act as such.

—At the annual election of the Southern Central Railroad Company, held on the 6th inst., at Auburn, N. Y., the following gentlemen were elected directors: Homer N. Lockwood, Wm. H. Seward, Jr., Adam Miller, Charles G. Briggs, A. H. Goss, D. M. Osborne, John J. Taylor, Thos. C. Platt, C. L. Rich, J. W. Dwight, H. K. Clark, Geo. I. Post, and Chas. F. Welles. At a subsequent meeting the following officers were elected: John J. Taylor, President; Geo. I. Post, Vice-President; Wm. H. Seward, Jr., Treasurer; Homer N. Lockwood, Secretary.

—Colonel James Scott, of Lebanon, O., Major John J. Safely, of Washington, D. C., and Isaac H. Sturgeon, Esq, of St. Louis, have been appointed, by the President of the United States, Commissioners to examine and report upon the Burlington & Missouri River Railroad. This is to determine whether it has complied with the conditions which will entitle it to the government land grant.

PERSONAL.

—The *Official Railway Guide* notices as follows the appointment of Captain Hodsdon: "Captain I. S. Hodsdon succeeds Mr. Thomas L. Kimball as Order Agent of the Pennsylvania Railroad Company, with headquarters at the northwest corner of Randolph and LaSalle streets, Chicago, Ill. Captain Hodsdon was formerly connected with the Passenger Department of the Panhandle Route, and acquired an enviable reputation in that connection by his strict attention to business and unswerving fidelity to the interests committed to his charge. The present appointment indicates pretty clearly the estimation in which Captain Hodsdon is held by the Pennsylvania Railroad Company; and we are confident that he will perform the responsible duties of his position with the same energy and skill which have been, heretofore, his special characteristics." The Pennsylvania Railroad Company has nowhere any more faithful and trustworthy servant than Captain Hodsdon.

—C. G. Wykoff, Secretary and Treasurer of the Southern Minnesota Railroad Company, died at La Crosse, Wis., recently, of pleurisy and congestion of the lungs.

TRAFFIC AND EARNINGS.

—The traffic receipts of the Great Western of Canada for the week ending August 11, amounted to £17,953, against £14,370 in the corresponding week of last year, showing an increase of £3,583, or 25 per cent.

—The traffic receipts of the Grand Trunk of Canada, for the week ending August 12, amounted to £34,800, against £29,099 in the corresponding week of last year, showing an increase of £5,701, or 19½ per cent.

CHICAGO RAILROAD NEWS.

Chicago & Alton.

The draw-bridge over the Illinois River, on the Louisiana Branch, was swung on Wednesday of this week. The track will now be laid as rapidly as possible between that point and the Mississippi River.

The earnings for the month of August were $529,278.21, and for the same month last year, $506,680.59; showing an increase of $22,597.62, or about 4½ per cent.

Illinois Central.

It is reported that this company has made a new agreement concerning the lease of the Dubuque & Sioux City and Iowa Falls & Sioux City railroads. By the terms of the present lease the Illinois Central pays 35 per cent. of the gross earnings as rental until 1877, and 36 per cent. thereafter until the lease expires, in 1887, to the Dubuque & Sioux City Company; $1,500 per mile and a further rent of 35 per cent. on gross earnings exceeding $3,500 and less than $7,000 per

mile, and of 30 per cent. on gross earnings exceeding $7,000 per mile for the Cedar Falls & Minnesota Railroad, and a rental of 35 per cent. to the Iowa Falls & Sioux City Company.

It is reported that the new arrangement is for a perpetual lease at a fixed rental, which, an Iowa paper reports, will be sufficient to pay the interest on the bonded debt and 6 per cent. on the capital stock. This would make the amount of the fixed rental very nearly $1,000,000 per year for 402 miles of road which last year earned in gross about $1,467,000, and for which a rental of $572,500 was paid. It is only the prospect of a large increase in receipts and the prospect that a rival company might obtain a contract for a lease after the expiration of the present limited term that could induce such a change. But there is certainly every prospect that there will be such an increase, and, indeed, it is probable that the receipts of the Iowa lines will eventually exceed those of the Illinois lines of this company, as the country is certainly fully as good, and the lines are now nearly in the direction of the prevalent course of traffic.

OLD AND NEW ROADS.

Union Pacific.

The company are advertising in the Council Bluff papers for two million hard-burned brick, which, it is supposed, are to be used in the construction of the new depot building in that city.

Honduras Interoceanic.

A section of this railroad, 36 miles long, from Puerto Cabellos to San Pedro, was opened on the 11th of July.

Union Pacific.

The regular quarterly meeting of the Board of Directors of the Union Pacific Railroad was held in Boston on the 6th inst., five members of the board being absent. A committee, consisting of Thomas A. Scott, President; John Duff, Vice-President; Sidney Dillon, C. S. Bushnell, and Royall E. Robbins, was appointed to confer with a committee of the Pacific Mail Steamship Company, in regard to the proposed consolidation of their utensils in the transportation of freight. The construction of a bridge across the Missouri at Council Bluffs was also discussed. It was agreed to combine with the other railroads centering at that point, and the whole matter was referred to a special committee, with full power to act in the premises.

North Missouri.

Morris K. Jesup, the purchaser of this railroad, has given the following order to the General Superintendent:

"The North Missouri Railroad having passed into my hands, all the former employes who desire it are retained for the present in the same capacity from this time, at the same salary and wages as they have been receiving from the said company, and you are authorized to give notice accordingly; and you are also authorized to give prompt notice that, in accordance with the usual custom in relation to purchases of railroads, the arrearages now due to mechanics and hands employed on said road will be settled as soon as they can be satisfactorily ascertained."

Cairo & St. Louis.

It has been determined to construct this railroad of 3-feet gauge on a line about 145 miles long, the contract has been let to H. R. Payson & Co., of Chicago, who are to construct and equip the road within two years, and grading is commenced.

The officers of the company are: Mr. S. Staats Taylor, of Cairo, President; Hon. Wm. R. Morris, of Waterloo; R. H. Rosborough and Anthony Steele, of Sparta; T. M. Logan and Judge Wm. Bradley, of Murphysboro; John E. Nail and Judge M. C. Crawford, of Jonesboro; Wm. P. Halliday, Daniel Herd and Hon. W. J. Allen, of Cairo, directors.

Chicago & Southwestern.

The Atchison *Champion* says that the corporation organized to construct a branch of this road to Atchison was consolidated with the Chicago & Southwestern on the 16th inst. It is intended to have this branch completed by the end of the year.

All the iron for the branch from Plattsburg to Atchison arrived from Europe on the 6th of this month.

California Pacific.

This company before its consolidation with the Central Pacific (or purchase by that company) threatened to construct a new railroad to Ogden to connect with the Union Pacific, and went so far as to close a contract with D. H. Haskell for the grading of 125 miles of road. Of course the Central Pacific does not care to build a road to compete with itself, and as no one is willing to pay Haskell to fulfill his contract, he proposes to bring suit to ascertain if some one is not responsible for its violation.

Oshkosh & Mississippi.

The Oshkosh (Wis.) *Northwestern* says: "We are happy to be able to announce that the arrangements are completed for the ironing and equipment of the road from here to Ripon. The President of the road, Captain Jenkins, has closed the contract with the Milwaukee & St. Paul road, by which the track will be laid and the cars running by the 1st of December, if not sooner."

Decatur & State Line.

On Wednesday of this week, Messrs. J. B. & L. Brown took the contract to grade 28 miles of this road, from Mokena, on the Rock Island road, to the Kankakee River—the work to be completed by November 16, 1871. On the same day a contract for doing the masonry for culverts, etc., for this 28 miles was let to Mr. Alexander Bruce, of Marseilles, Ill.—the work to be done by November 14. The bridge work was also to be contracted for this week. The remaining contracts for completing this portion of the road by January 1, 1872, will now be let as soon as possible.

Augusta & Hartwell.

The general contractors for this proposed Georgia railroad are prepared to let contracts for grubbing, etc. It is to extend from Augusta, Ga., northwestward, not far from the Savannah River, and to make a connection with the Blue Ridge Railroad or other line crossing the mountains, for Knoxville, Cincinnati, Louisville, and the Northwest.

Cumberland Valley.

The laying of track has been commenced on the extension of this railroad from Hagerstown, Md., southwest to Williamsport, on the Potomac, about ten miles.

Intercolonial Railway.

The commissioners advertise for tenders for the track-laying and ballasting of 75½ miles of line in Nova Scotia, and also for 300 tons of spikes, to be delivered at Truro and Amherst.

Knox & Lincoln.

This Maine railroad is now completed from Bath northeastward to Waldborough, which is eleven miles beyond the recent terminus at Damariscotta.

Western of Alabama.

This company is laying new rails with fish-joint on its leased line, the Montgomery & West Point, which connects Montgomery with both West Point and Columbus, Ga.

Manchester & McMinnville.

This railroad was sold at Manchester, Tenn., on the 17th ult. The Memphis & Charleston Railroad Company was the purchaser. Favorable terms were obtained by the stockholders of the former company. The purchasers have agreed to extend the road northeastward to Sparta, Tenn., and to have it in runnning orto that point within eighteen months, and to extend it south from Manchester or Tullahoma to Huntsville, Ala., by which latter alone will it be connected with the Memphis & Charleston.

Bachman Valley.

Mr. Cyrus Diller, of Hanover, Pa., has received the contract for the grading and masonry of the Pennsylvania Division of the Bachman Valley Railroad, commencing at the Hanover Branch Railroad, near Leib's Mill, thence following a branch of Codorus Creek to Klinefeltersville, and thence on to the State line. The work of grading is commenced. Mr. Gitt is completing the location from the State line to the Chestnut Hill ore banks, which is shortly to be let, and the entire work of grading is to go on and be pushed forward as rapidly as possible.

Sioux City & St. Paul.

This railroad is open to Windom, Minnesota, 147 miles southwest of St. Paul, and 25 miles from St. James, the terminus of St. Paul & Sioux City road, of which the Sioux City & St. Paul Railroad forms an extension. The road is to be completed and put in operation this season to Okoboji Lake, six miles from the Iowa State line, and sixty miles from St. James, at which point work was commenced this season. This will leave about sixty-four miles of road to build to complete the road to LeMars, where it will form a junction with the Dubuque & Sioux City road. This is to be graded this fall, so that it may be completed early next season.

London, Huron & Bruce.

The Toronto, Grey & Bruce Company have made an arrangement with the above company for united action in asking bonuses from the townships interested. By the terms of the bargain the same line is to be used for both roads for about 30 miles eastward from Lake Huron, the junction taking place at the village of Wingham, near the northern limit of Huron County. This important arrangement renders the extension of the Toronto, Grey & Bruce to Lake Huron, comparatively certain, and also secures to London the success of their line.—*Canadian Monetary Times.*

Davenport & St. Paul.

Officers of this company have been examining the country for a route for their road between the north line of Iowa and St. Paul. One of the routes under consideration is by way of Preston, Fountain, Chatfield and Rochester.

Boston, Hartford & Erie.

At Boston, on the 6th inst., Judge Clifford denied the motion of Enoch Sweatt, of Woonsocket, for a review and revision of Judge Shepley's decree placing the Boston, Hartford & Erie Railroad in bankruptcy. The opinion was that the corporation was private and commercial in its character, as a common carrier of passengers and freight between the several States, and, therefore, came within the meaning of the bankrupt act.

West Wisconsin.

The Dunn County (Wis.) *News* says: "Track-laying has again commenced on the West Wisconsin Railroad, west of this place. Ten or twelve miles of the iron rails have been spiked down. We are also informed that the grading between Menominee and Hudson is virtually finished. Between St. Paul and Lake St. Croix about 2,000 men are at work night and day. The railroad at Hudson will be completed by the middle of November, and by December 1st we prophesy Menominee will be in direct railroad communication with the saintly capital of Minnesota."

Vineyard Sound Railroad.

The Cape Cod Railroad Company is about to construct this railroad from a junction with its main line near Cohasset Narrows nearly due south about 18 miles along the eastern shore of Buzzard's Bay through Pocasset, South Pocasset, Sandwich, North Falmouth, West Falmouth, Falmouth Village, near Falmouth Heights, to the harbor of Wood's Hole, where it will connect with steamers for Martha's Vineyard, only five or six miles distant.

Peoria & Rock Island.

This new railroad is now fully open for business, and on the 15th inst. it will commence carrying mails.

Cincinnati, Richmond & Fort Wayne.

In the Allen County (Ind.) Circuit Court, W. H. Jones had filed a complaint praying that a perpetual injunction, restraining the city of Fort Wayne, the Treasurer of said city, and the Cincinnati, Richmond & Fort Wayne Railroad Company, be issued in regard to the delivery and acceptance of the $100,000 subscribed to the said road by the city; and that the Treasurer be required to bring said bonds into court, and there destroy them, as having been unlawfully and wrongfully executed. It is understood that complainant places his objections on the ground that the Richmond road does not enter the city on its own track and right of way, but on that of the Pittsburgh, Fort Wayne & Chicago Railroad.

Paris & Decatur.

A correspondent writes as follows:

"This road has been in course of construction for about ten months, under charge of Chief Engineer J. P. Dunlap, who resigned a few days ago. Now Geo. B. Phinney, of Champaign, Ill., has chief control of construction. The grading is nearly all completed to Lovington, in Moultrie Country, about 45 miles. Twenty miles more, to Decatur, will be finished in the next sixty days. Mr. C. C. McKinley, of Champaign, contractor for ties and bridges, is pushing that part of construction rapidly, assisted by the veteran bridge-builder, Mr. A. A. Dunseth, of Danville, Ill. Track-laying commenced at Paris the 30th of August. The silver spike was driven by the President of the road, Mr. Dwight Hitchcock, amid the firing of cannon and the huzzas of hundreds of Parisians. Mr. Orlopp, Superintendent of Track laying, will push forward toward Decatur, which he confidently expects to reach by the holidays."

Lancaster Railroad.

This Massachusetts company advertises for bids for the grading, bridging and superstructure of its road to be received until September30. Specifications can be seen athe office of the Engineer, C. C. F. Bent, Lancaster, Mass.

Montgomery & Eufaula.

This Alabama railroad has lately been opened to Fort Browder, 66 miles southeast of Montgomery, 13 miles from the late terminus at Midway, and within 14 miles of Eufaula, where it will connect with the Southwestern Railroad of Georgia. The entire line is to be opened very soon.

Burlington, Cedar Rapids & Minnesota.

A branch of this railroad is proposed from Cedar Rapids nearly due north through Independence to some point on the Milwaukee & St. Paul road, and Independence has voted to subscribe $30,000 in aid of it.

Port Royal & Augusta.

The Beaufort (S. C.) *Republican* reports that work has been recommenced on this railroad near Yemassee, about 20 miles northeast of Beaufort. Rails have been ordered, and a section of the road will soon be opened for use.

Peninsular.

This railroad was completed through South Bend, Ind., on the 1st inst., and is progressing favorably towards Valparaiso. The road is now in operation from Lansing southwestward through Charlotte, Battle Creek, Cassopolis and South Bend, a distance of 120 miles.

Mexico & Monroe City.

The Mexico (Mo.) *Messenger* says of this projected road, about 30 miles long, between the North Missouri and Hannibal & St. Joseph roads:

"The survey of this proposed road has been made on two distinct lines from Mexico to the crossing of Salt River, near Florida, in Monroe County. From that point there is only one available line of construction.

"Mr. Hardin informs us that it is the intention of the company to have an intermediate line surveyed, in order that the cheapest and most practicable route may be secured. He also informs us that the engineer having the survey in charge will submit in a short time the estimates of the the cost of the grading, bridging, etc., of the road, and these estimates will embrace the cost per mile."

Hudson River.

This railroad now has a continuous double track of steel rails from New York to Albany.

Prince Edward's Island.

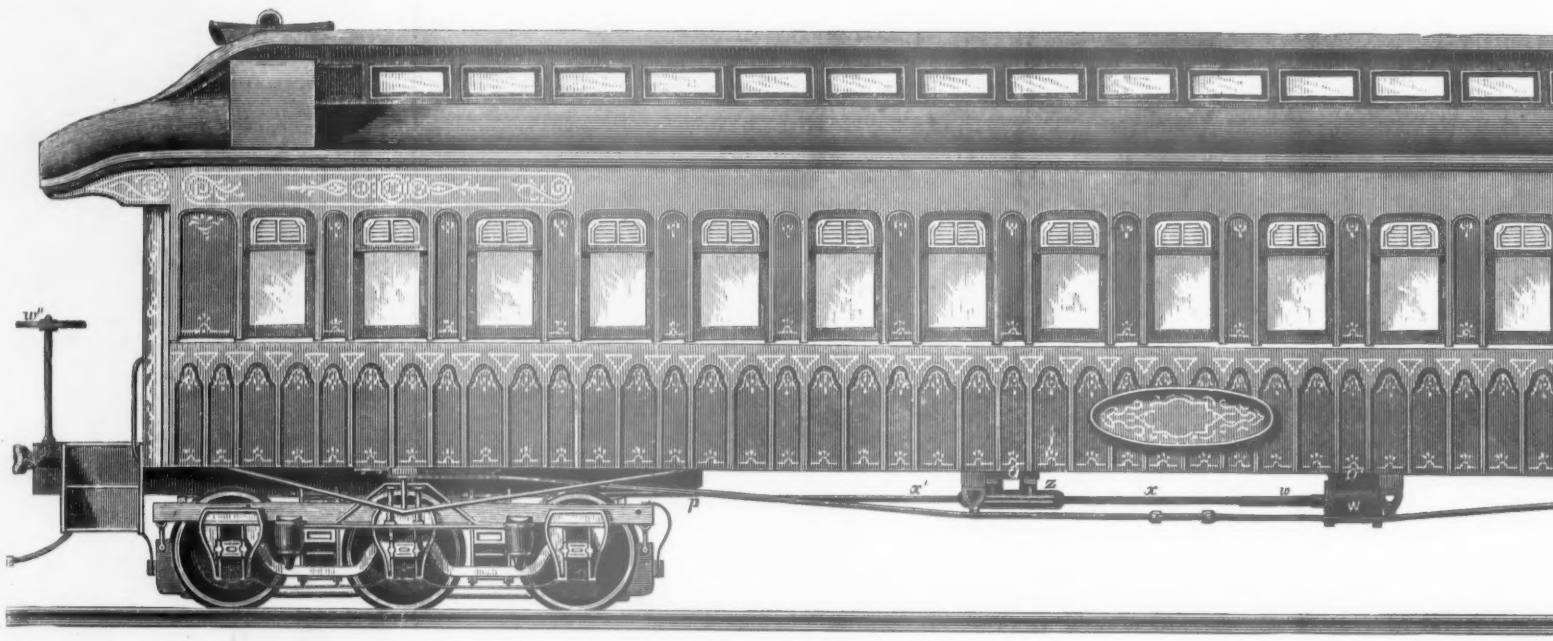
The price at which the construction of the narrow-gauge railroad across this island was let was £4,355 per mile.

Dakotah Southern.

Under this name it is proposed to construct a railroad from Yankton, Dakota, either southeastward down the Missouri River to Sioux City, or nearly due east to Le Mars, the junction of the Dubuque & Sioux City with the Sioux City & St. Paul Railroad, 23 miles northeast of Sioux City. Either line would be about 65 miles long. On the 2d inst., Yankton County voted to issue $200,000 in bonds to aid in the construction of this road, and it is reported that contractors are now willing to undertake its completion within eighteen months.

Iowa Pacific.

In the last week in August a contract was signed with the Fort Dodge Construction Company, of which Mr. John F. Duncombe, of Fort Dodge, is President, for grading 30 miles of this road, from Fort Dodge northwest to Clarion, the county seat of Wright County. The work was to have commenced this week. It is the intention to very soon put under contract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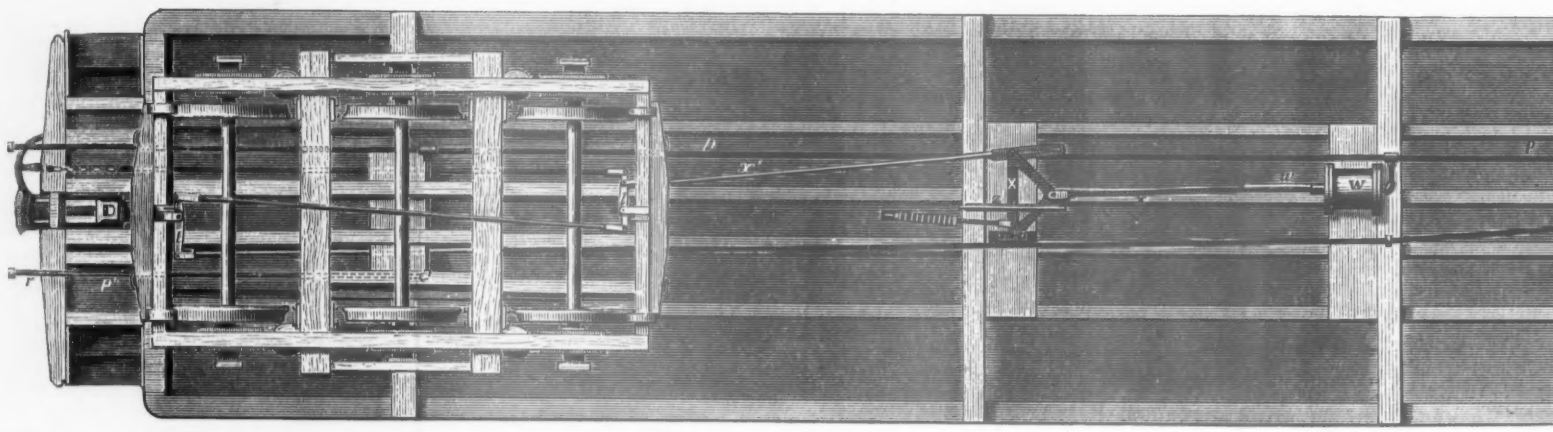
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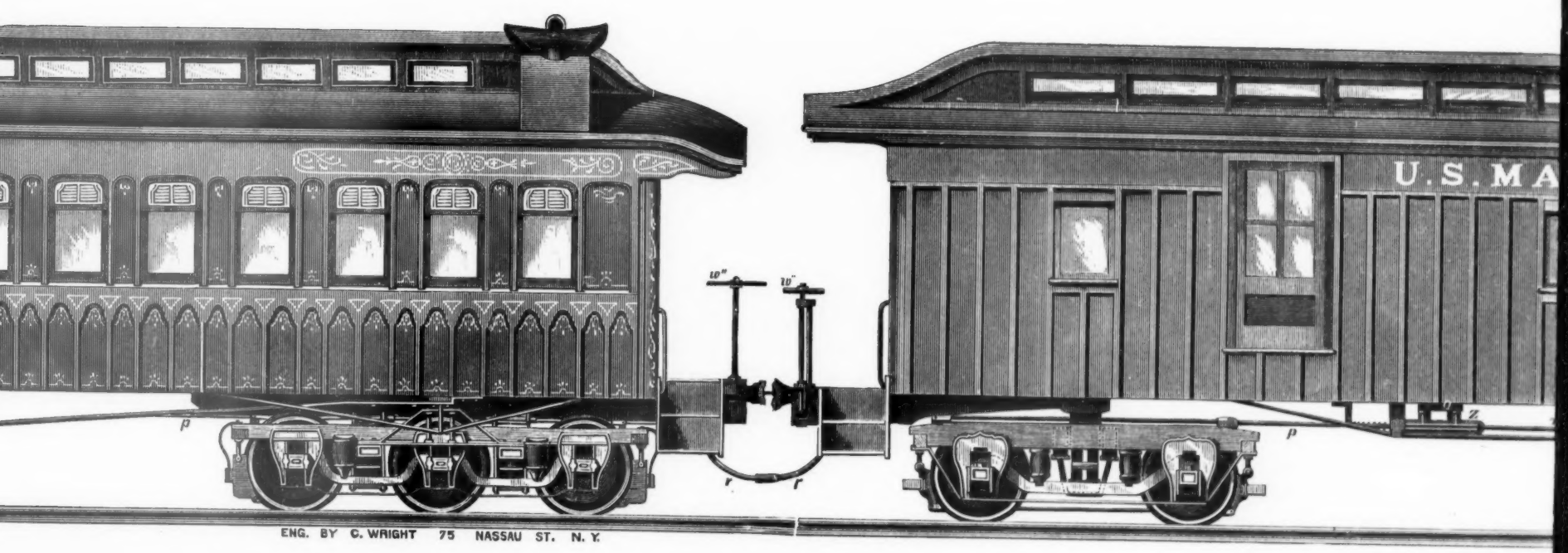

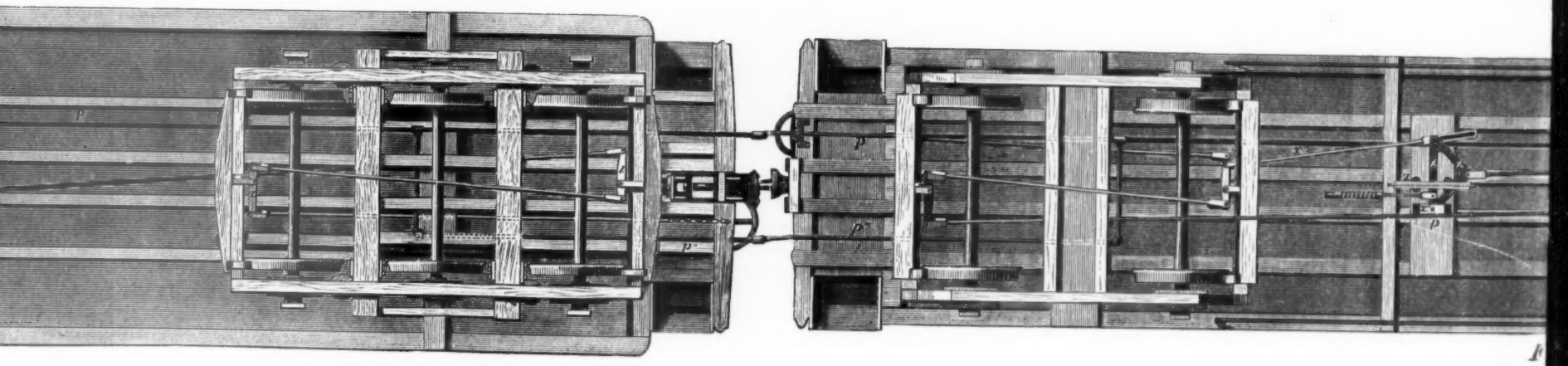

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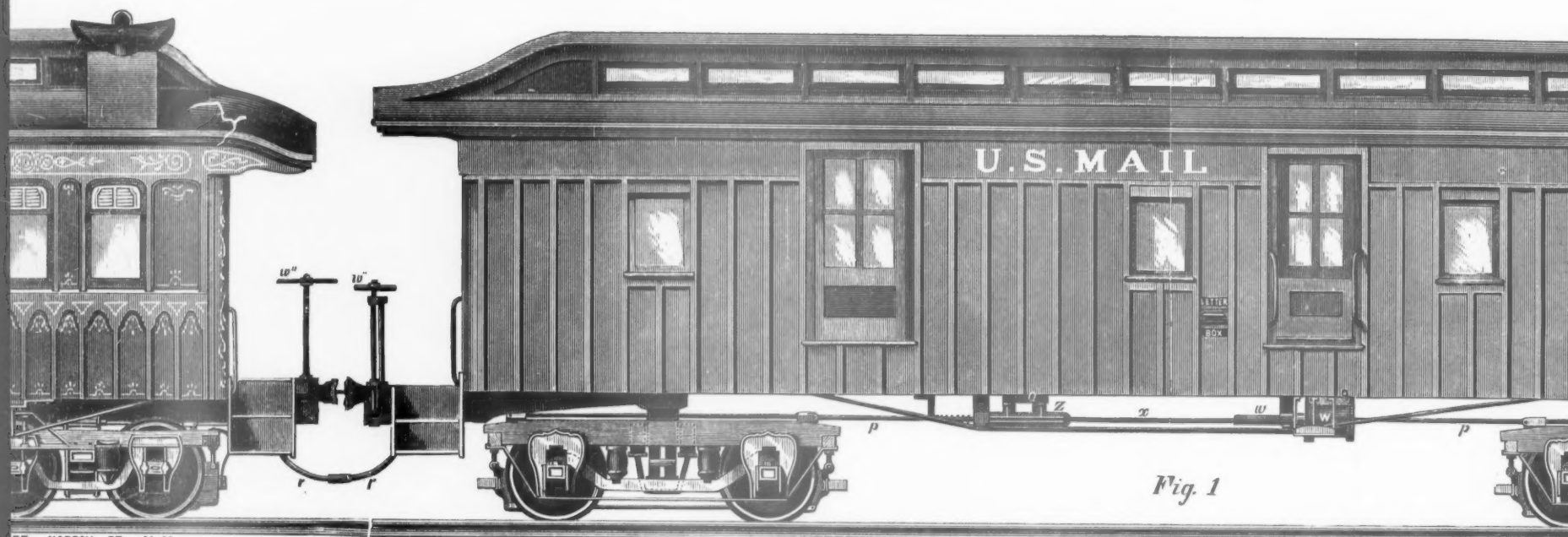

Fig. 1

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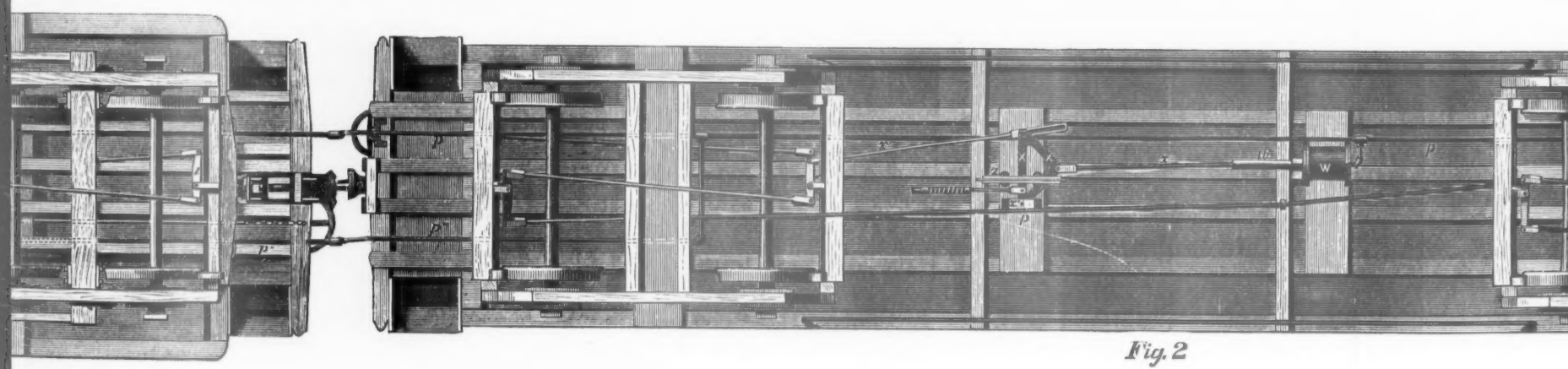

Fig. 2

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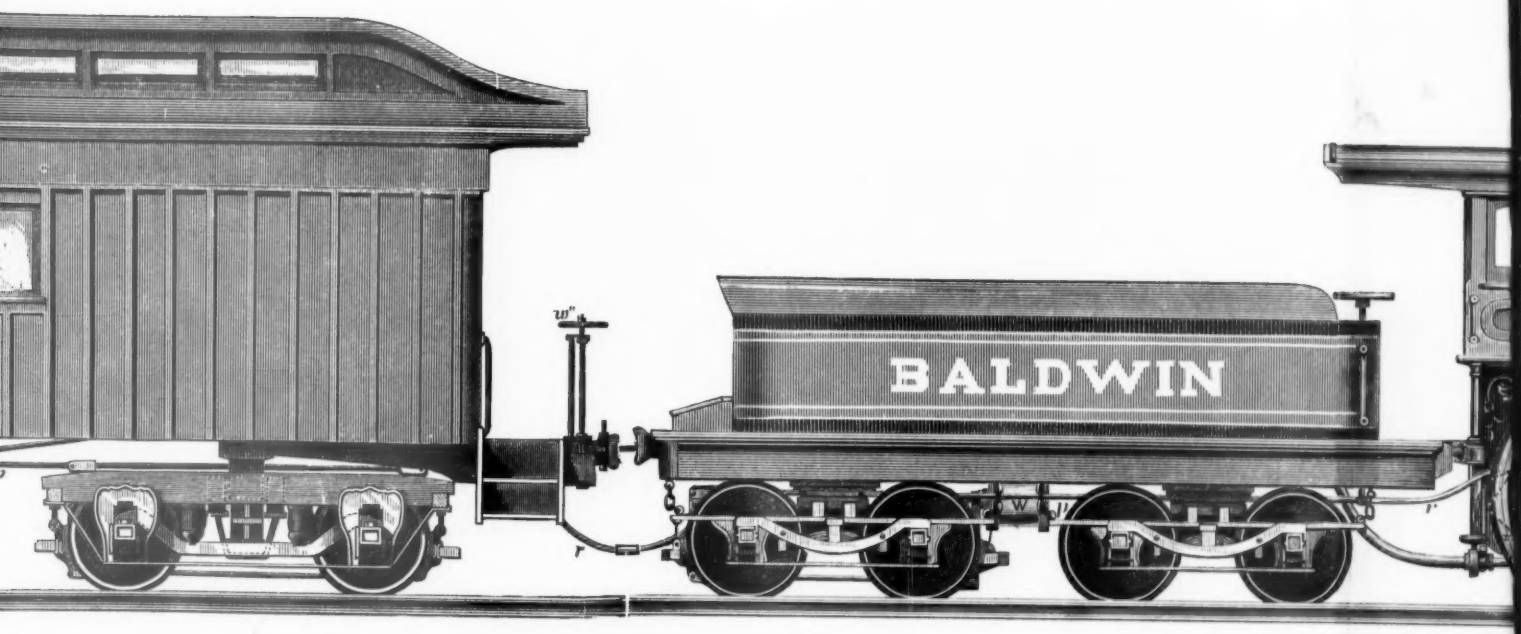

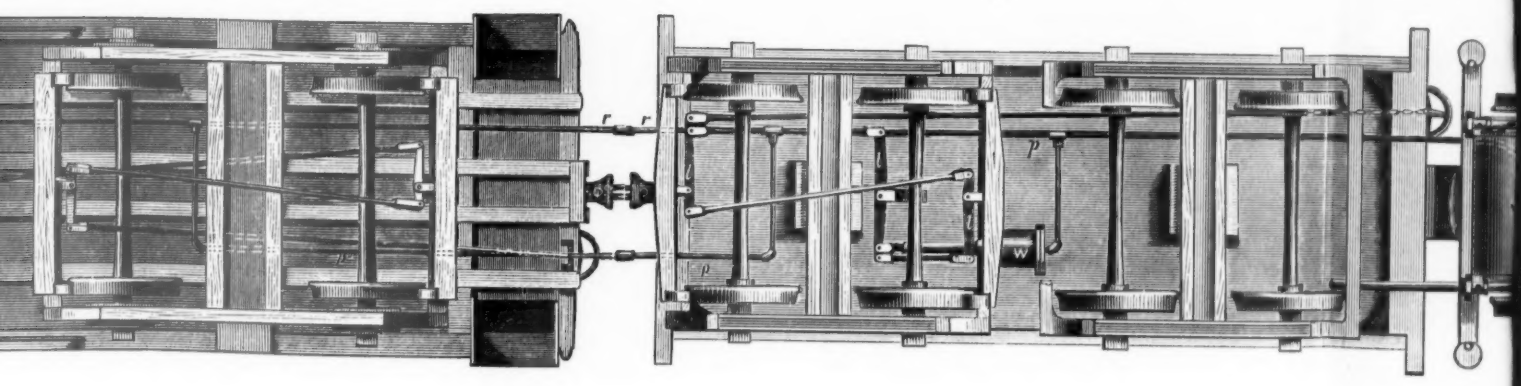

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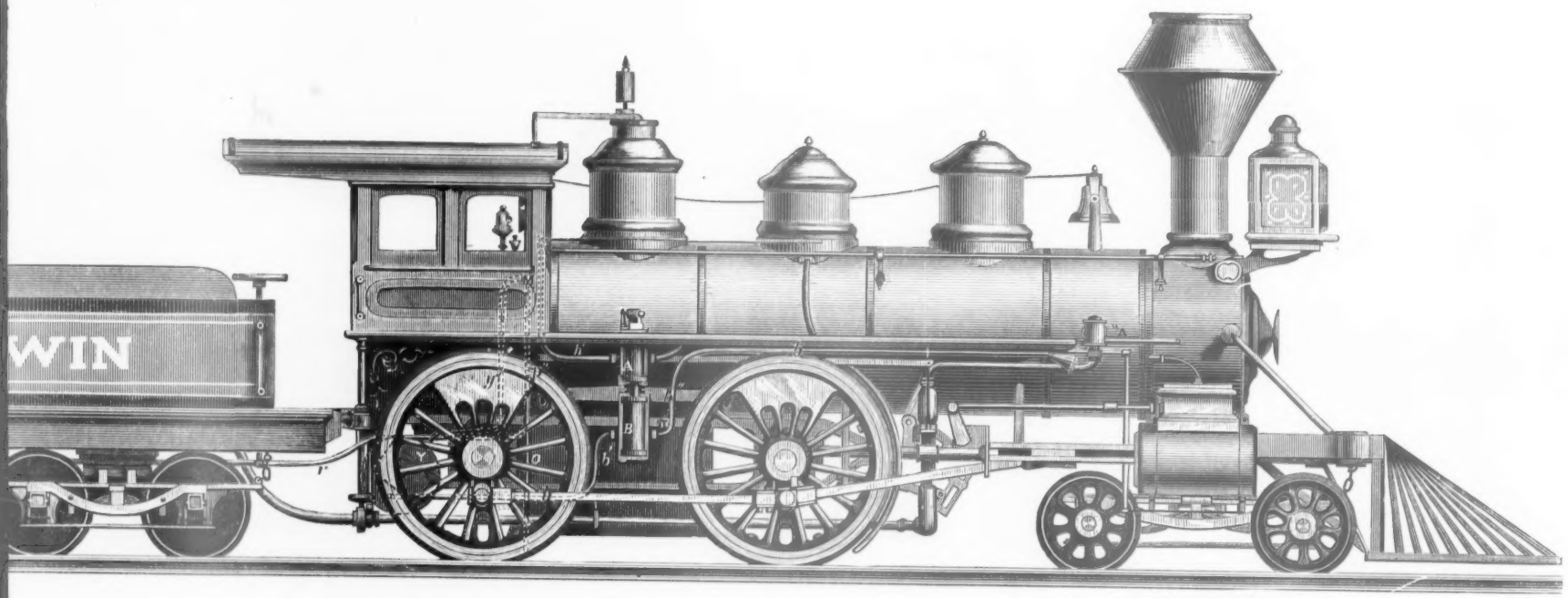


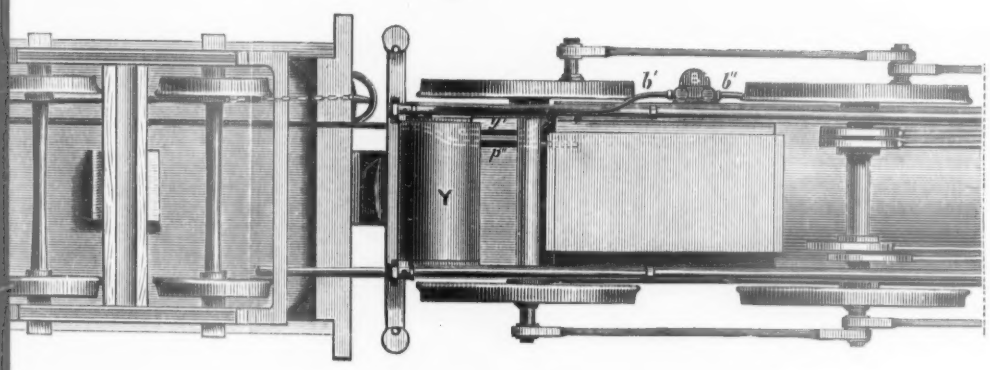
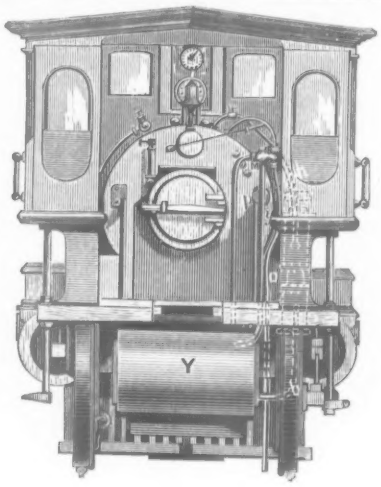


Fig. 3



another section, about 50 miles, from Waverly, the county seat of Bremer County, eastward to a connection with the Chicago, Dubuque & Minnesota road, near the mouth of Turkey River.

California Railroads.

The California & Oregon road is completed and in operation—by the Central Pacific Company—to Tehama. The San Francisco *Call* says: "The Central Pacific Company is pushing its San Joaquin Valley Branch road rapidly forward from Modesto. The track is laid a distance of thirteen miles toward Merced Bottoms, which it will reach in the course of fifteen days. The same company is now locating the route for a branch road eastward."

The Visalia *News* says the Stockton & Visalia road is graded to the Stanislaus River.

Memphis & Kansas City.

Messrs. Burgess & Hays have the contract for the work between Springfield and Greenfield. Mr. Riley, who had charge of the commencent of this work, has gone to commence work in Dodge County, north of Greenfield.

New York Central & Hudson River.

The general ticket office at Albany has been discontinued, and the General Ticket Agent, Mr. C. H. Kendrick, now has his office in the Forty-second Street Depot, New York.

Rome & Eagle Bridge.

A company has been formed to construct a railroad from Rome, N. Y., eastward about 90 miles to Eagle Bridge, a few miles east of Bennington, Vt. This will give a short connection from Buffalo and Ogdensburg with the Hoosac Tunnel route into Massachusetts.

Elizabethtown & Paducah.

Contractors are at work west of the Tennessee River and also from Paducah eastward to Clark's River. A large force is employed in construction. It is expected that the whole road will be completed by July of next year.

Cincinnati to Jackson.

Running arrangements have just been made by the Indianapolis, Cincinnati & Lafayette, White Water Valley, Fort Wayne, Muncie & Cincinnati, and Fort Wayne, Jackson & Saginaw railroads, for a double daily train service by the above named roads, between Jackson, Mich., and Cincinnati, O. On and after September 3d, trains will leave Jackson, (going south), 6:20 a.m. and 4:50 p.m.; Fort Wayne, 11:00 a.m. and 10:00 p.m., arriving at Indianapolis, 4:30 p.m, and 6:30 a.m.; at Beesons, 4:30 p.m. and 4:30 a.m.; at Cincinnati, 7:45 p.m. and 8:00 a.m. Going north—Trains leave Cincinnati, 7:00 a.m. and 5:00 p.m.; leave Beesons, 10:30 a.m. and 8:15 p.m.; arrive at Fort Wayne, 4:00 p.m. and 12:50 a.m.; at Jackson, 8:30 p.m. and 5:00 a.m.—*Official Guide.*

Laclede & Fort Scott.

The secretary of this company is authority that the terms of a contract with Messrs. Geo. A. Fitch & Co., of St. Louis, have been agreed upon for the construction of the entire line from Fort Scott to the Mississippi River. The directors were to have met yesterday, at Lebanon, Mo., to ratify or reject the contract.

Bachman Valley.

The Pennsylvania sections of this road are under contract, and it is to be completed from Klinefelter's across the Hanover Branch and to the State line by next Christmas. It is said that the road will be let, soon from the State line to the Chestnut Hill ore mines, in Carroll County, Md.

Atlantic & Great Western.

The Cleveland *Herald* of the 2d says:

"At noon of Friday, September 1, the Atlantic & Great Western Railway, with all the property connected with that organization, was formally transferred by the Receiver to the Trustees under the reorganization of the company The transfer took place at Akron, and on its completion the three Trustees—General McClellan, Judge Thurman, of Ohio, and Mr. Duncan, of New York—took possession of the railroad and all its appurtenances in behalf of the newly organized Atlantic & Great Western Railroad Company. The new organization comprises all the various classes of bondholders, with the exception of a portion of the bonds held in Holland, and so many of the stockholders as signed the agreement, and consented to the scaling down of their stock. It is believed that by far the greater part of the stockholders have come into the arrangement. There is no opposition to the scheme on the part of the bond and stockholders who have not come into the arrangement, they merely preferring to take their chances outside of the arrangement. The Dutch bondholders have been paid their overdue interest, and are now working in harmony with the new organization. The stockholders who stand out do so because they think the investment is good, and that, after the bonds have all been provided for, there will be more value left in the common stock than is allowed for it now in scaling down for the new organization. The Trustees, who now have temporary control of the property, during the perfectment of the reorganization, will probably surrender their trust within thirty days to the company, when General McClellan will become its President. All arrangements with the Erie Railroad Company ceased at noon on Friday, and the two lines are now merely connecting roads. Important changes are in contemplation, and will be commenced at once, the object of which is to make the Atlantic & Great Western independent of the Erie, whilst maintaining friendly relations with it. The first step, to be taken immediately, is the laying of a double track (narrow gauge), with steel rails, on the Cleveland Branch (Cleveland & Mahoning). The rails taken up from the Cleveland Branch to be used toward laying a third rail from Leavittsburg eastward, so that narrow-gauge cars can pass over the main line east of Leavittsburg. Arrangements have already been perfected with the Philadelphia & Erie Railroad, by which narrow-gauge traffic between Cleveland and the Atlantic cities can pass over the Atlantic & Great Western to Corry, and thence over the Philadelphia & Erie and its connecting lines. Connections will be made with the New York Central also, either over the Buffalo Division of the Atlantic & Great Western, which in that case will be completed without delay, or over another line in course of construction. With these arrangements completed, the Atlantic & Great Western will form a part of a narrow-gauge line, by way of Corry, Harrisburg and Philadelphia, another narrow-gauge line by way of Buffalo and the New York Central, and a broad-gauge line by way of the Erie. The building of a short link, twelve or thirteen miles, from the Mahoning line to the Baltimore & Ohio Extension, will open a new and short route between Cleveland, Baltimore and Washington. Other projects are contemplated by which, without great expenditures of capital, new outlets and feeders will be secured to the line and its value enhanced."

Atchison & Nebraska.

Mr. F. R. Firth, the Superintendent of this railroad, writes to us as follows:

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THE WESTINGHOUSE ATMOSPHERIC BRAKE.

The necessity of having some effective means of stopping railroad trains was felt as soon as it was found possible to run them at any considerable speed. The problem of how to stop a train was therefore presented simultaneously with the introduction of locomotives. As the speed and length of trains increased, the importance of placing them under the control of the locomotive runner became with each new accident and tale of horror more evident. For years, therefore, inventors have been exercising their ingenuity in endeavoring to devise some means which would enable the man who runs the engine to apply the brakes instantly on the whole train behind him. Every master mechanic and railroad engineer has had his time wasted and his patience tried by being obliged to examine models and plans of every conceivable variety intended to solve the problem. The importance of some really good means of accomplishing the end sought has only made the importunity and impracticable schemes of visionary inventors more aggravating to those who were called upon to pronounce upon the merit of their inventions.

It therefore gives us much pleasure to present our readers with complete plans and detail drawings of the Westinghouse Atmospheric Brake, a system which has already been extensively introduced, and is the first one which has thus far come at all near to fulfilling the requisite conditions of an automatic brake.

As its name indicates, the medium employed for transmitting the power to the brakes is atmospheric air. This is compressed to any required density by a steam pump, *A*, *B*, figs. 1 and 2, located between the driving-wheels or at any other convenient position on the locomotive. The air is forced into a reservoir, *Y*, so that a sufficient supply will at all times be ready for use. From this reservoir it is conducted back under the cars of the train by pipes, *p*, *p*, *p*, *p*, which are connected together by india-rubber hose, *r*, *r*, *r*, and suitable couplings, which will be described hereafter. Under each car is a cylinder, *W*, *W*, *W*, to which the compressed air is admitted forward of a piston, the stem of which is connected to a bell crank, *X*, *X*, fig. 2, centered at x'', and is attached to the brake levers by the rods, x', x'. By this means when air is admitted in front of the piston in the cylinder the brakes are at once applied to the wheels.

The ordinary brake rods, x', x', are attached to the bell-cranks with long slots, so that the brakes can be drawn up by the ordinary hand gear without interfering at all with their connections with the cylinders.

It should also be observed that air is admitted into the pipes, *p*, *p*, from the reservoir by a cock, *M*, fig. 8. It will thus be seen that all the brakes can be applied instantaneously by the locomotive runner, and with any amount of power which may be required. In doing this he has only to open the cock, *M*, more or less, in proportion to the power he wishes to apply.

Such are the principal features of this invention, but in putting it into practical operation many difficulties were encountered, and much ingenuity has been exercised in overcoming them.

The air pump, *A*, *B*, is bolted to the locomotive frame, between the driving-wheels. *A* is the steam cylinder and *B* the air cylinder, which are shown in sections on an enlarged scale in figs. 4, 5 and 6. Between them is a stuffing-box, *F*, through which passes the piston-rod, D'. The steam cylinder is of the usual construction, and has a steam chest, H', fig 7, on one side, and an exhaust chamber, H'', on the other. In each end of the steam chest is a valve seat, 1, 1, fig. 5, made slightly conical, with one or more ports, 1, 1, figs. 5 and 11, leading thence through the sides of the seat to an annular chamber, 2, 2, which surrounds it, which annular chamber communicates by an open port, fig. 11, with the inside of the cylinder. Each valve seat is fitted with a valve, 3 and 4, fig. 5, slightly conical in form, both valves being on the same stem, *H*. Lengthways in the face of each valve are two ports, 5 and 6, fig. 5, the ports leading, one from the end of the valve to a port in the valve seat, and the other from the same port in the valve seat to the opposite end of the valve. These valve ports are, by an oscillating motion, brought alternately over the open port of the valve seat, from which connection is made by the annular chamber to the inside of the cylinder. Steam enters the steam-chest between the valves, and the ports of the two valves which correspond in position have their end openings in the same direction; so that while a valve port of one valve is taking steam to actuate the main piston the corresponding part of the other valve is acting as an exhaust port. These valve ports are arranged in pairs, two, four or six to each valve, with a port in each valve seat for each pair of valve ports.

another section, about 50 miles, from Waverly, the county seat of Bremer County, eastward to a connection with the Chicago, Dubuque & Minnesota road, near the mouth of Turkey River.

California Railroads.

The California & Oregon road is completed and in operation—by the Central Pacific Company—to Tehama. The San Francisco *Call* says: "The Central Pacific Company is pushing its San Joaquin Valley Branch road rapidly forward from Modesto. The track is laid a distance of thirteen miles toward Merced Bottoms, which it will reach in the course of fifteen days. The same company is now locating the route for a branch road eastward."

The Visalia *News* says the Stockton & Visalia road is graded to the Stanislaus River.

Memphis & Kansas City.

Messrs. Burgess & Hays have the contract for the work between Springfield and Greenfield. Mr. Riley, who had charge of the commencent of this work, has gone to commence work in Dodge County, north of Greenfield.

New York Central & Hudson River.

The general ticket office at Albany has been discontinued, and the General Ticket Agent, Mr. C. H. Kendrick, now has his office in the Forty-second Street Depot, New York.

Rome & Eagle Bridge.

A company has been formed to construct a railroad from Rome, N. Y., eastward about 90 miles to Eagle Bridge, a few miles east of Bennington, Vt. This will give a short connection from Buffalo and Ogdensburg with the Hoosac Tunnel route into Massachusetts.

Elizabethtown & Paducah.

Contractors are at work west of the Tennessee River and also from Paducah eastward to Clark's River. A large force is employed in construction. It is expected that the whole road will be completed by July of next year.

Cincinnati to Jackson.

Running arrangements have just been made by the Indianapolis, Cincinnati & Lafayette, White Water Valley, Fort Wayne, Muncie & Cincinnati, and Fort Wayne, Jackson & Saginaw railroads, for a double daily train service by the above named roads, between Jackson, Mich., and Cincinnati, O. On and after September 3d, trains will leave Jackson, (going south), 6:20 a.m. and 4:50 p.m.; Fort Wayne, 11:00 a.m. and 10:00 p.m., arriving at Indianapolis, 4:30 p.m, and 6:30 a.m.; at Beesons, 4:30 p.m. and 4:30 a.m.; at Cincinnati, 7:45 p.m. and 8:00 a.m. Going north—Trains leave Cincinnati, 7:00 a.m. and 5:00 p.m.; leave Beesons, 10:30 a.m. and 8:15 p.m.; arrive at Fort Wayne, 4:00 p.m. and 12:50 a.m.; at Jackson, 8:30 p.m. and 5:00 a.m.—*Official Guide.*

Laclede & Fort Scott.

The secretary of this company is authority that the terms of a contract with Messrs. Geo. A. Fitch & Co., of St. Louis, have been agreed upon for the construction of the entire line from Fort Scott to the Mississippi River. The directors were to have met yesterday, at Lebanon, Mo., to ratify or reject the contract.

Bachman Valley.

The Pennsylvania sections of this road are under contract, and it is to be completed from Klinefelter's across the Hanover Branch and to the State line by next Christmas. It is said that the road will be let, soon from the State line to the Chestnut Hill ore mines, in Carroll County, Md.

Atlantic & Great Western.

The Cleveland *Herald* of the 2d says:

"At noon of Friday, September 1, the Atlantic & Great Western Railway, with all the property connected with that organization, was formally transferred by the Receiver to the Trustees under the reorganization of the company The transfer took place at Akron, and on its completion the three Trustees—General McClellan, Judge Thurman, of Ohio, and Mr. Duncan, of New York—took possession of the railroad and all its appurtenances in behalf of the newly organized Atlantic & Great Western Railroad Company. The new organization comprises all the various classes of bondholders, with the exception of a portion of the bonds held in Holland, and so many of the stockholders as signed the agreement, and consented to the scaling down of their stock. It is believed that by far the greater part of the stockholders have come into the arrangement. There is no opposition to the scheme on the part of the bond and stockholders who have not come into the arrangement, they merely preferring to take their chances outside of the arrangement. The Dutch bondholders have been paid their overdue interest, and are now working in harmony with the new organization. The stockholders who stand out do so because they think the investment is good, and that, after the bonds have all been provided for, there will be more value left in the common stock than is allowed for it now in scaling down for the new organization. The Trustees, who now have temporary control of the property, during the perfectment of the reorganization, will probably surrender their trust within thirty days to the company, when General McClellan will become its President. All arrangements with the Erie Railroad Company ceased at noon on Friday, and the two lines are now merely connecting roads. Important changes are in contemplation, and will be commenced at once, the object of which is to make the Atlantic & Great Western independent of the Erie, whilst maintaining friendly relations with it. The first step, to be taken immediately, is the laying of a double track (narrow gauge), with steel rails, on the Cleveland Branch (Cleveland & Mahoning). The rails taken up from the Cleveland Branch to be used toward laying a third rail from Leavittsburg eastward, so that narrow-gauge cars can pass over the main line east of Leavittsburg. Arrangements have already been perfected with the Philadelphia & Erie Railroad, by which narrow-gauge traffic between Cleveland and the Atlantic cities can pass over the Atlantic & Great Western to Corry, and thence over the Philadelphia & Erie and its connecting lines. Connections will be made with the New York Central also, either over the Buffalo Division of the Atlantic & Great Western, which in that case will be completed without delay, or over another line in course of construction. With these arrangements completed, the Atlantic & Great Western will form a part of a narrow-gauge line, by way of Corry, Harrisburg and Philadelphia, another narrow-gauge line by way of Buffalo and the New York Central, and a broad-gauge line by way of the Erie. The building of a short link, twelve or thirteen miles, from the Mahoning line to the Baltimore & Ohio Extension, will open a new and short route between Cleveland, Baltimore and Washington. Other projects are contemplated by which, without great expenditures of capital, new outlets and feeders will be secured to the line and its value enhanced."

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The exhaust valve ports of the upper valve open upward, and of the lower valve downward, and exhaust ports are made thence through the upper and lower cylinder heads to the exhaust chamber on the opposite side of the cylinder. The valves described operate with an oscillating motion. To secure this motion an auxiliary or reversing engine, *G*, figs. 4, 5, and 7, is arranged on the top of the main cylinder head. This reversing cylinder is fitted with an ordinary steam piston and stem, *e*, fig. 5. The outer end of the stem, 6, fig. 7, has an oblong slot or eye in which plays the wrist of a crank 6, fig. 7, on the main valve stem. A reciprocating motion in the reversing piston and stem then imparts to the main valve stem the oscillatory motion desired in the main valves. A set screw, 7, fig. 7, bears against the end of the valve stem to keep the valves carefully and accurately seated. The reversing or auxiliary steam cylinder casting, *G*, rests on the cylinder head, *E*. On the lower face of the cylinder casting is bored a cylindrical valve chamber, *a*, and on the outer face of the upper cylinder cover is bored a like chamber, *o*. Each chamber contains a cylindrical valve, the upper one, *a*, fig. 5 and *b*, fig. 13, being seated by two annular seats, 8 and 8, fig. 13, at a little distance apart on like seats on the upper end of its chamber, and the lower one, *c*, having a like arrangement of seats 9, 9, except that they are on the lower end of the valve, 9, and at the lower end of the lower chamber. These valves, when seated, are far enough apart to have a little vertical play. Each annular seat is the boundary of a groove, or, in other words, a groove is made in the upper end of the upper valve between the annular seats, and a like groove in the lower end of the lower valve between its valve seats. From the upper groove a steam port, 8', figs. 5 and 7, leads to one end of the reversing cylinder, and from the lower groove a like port, *c*, leads to the opposite end. By an ordinary steam passage, *E*, *E*, figs. 5 and 7, steam is admitted from the main steam port to the reversing chambers, but between the valves. The pressure of steam so admitted tends to hold both valves to their seats.

To lift these valves from their seats alternately and allow steam to pass alternately into and through the annular grooves, and, by the parts referred to, into the reversing cylinder, is the next point to be attained.

For this purpose both valves are placed loosely on a common stem, *a*, *a*. By means of a knob on the upper end of this stem, above the upper valve, provision is made for depressing this valve from its seat. The lower valve has, projecting from its lower face, inside its annular seats, a sleeve, which passes over the valve stem and through a cylindrical hole in the upper cylinder cover, into the main cylinder a distance equal to the lift desired in that valve. The main piston stem is hollow, and the valve stem last referred to extends down into it with a knob, *d*', on its lower end. On the upper end of the steam piston is a plate, *d*, having a hole through which the valve stem passes—the hole being too small for the knob to pass through. Then as the steam piston approaches the end of its downward stroke and the time comes for the reversal of the main valves, the plate on the main piston engages the knob on the lower end of the reversing valve stem and depresses or lowers the upper reversing valve. Steam then passes from between the reversing valve through between the upper valve and its stem (the two fitting with sufficient looseness to permit of it) into the annular groove, and through the port, 8', to the reversing cylinder. This gives the reversing piston, *e*, the required throw in one direction so as to shift, by the crank connection above described, the position of the main valves.

A short stroke in the reversing piston is amply sufficient; and hence the piston may be made nearly as thick as one-half the length of stroke desired. A single exhaust port, 1', 1', figs. 5 and 7, leads from the middle of the reversing cylinder to the waste pipe marked "exhaust." As soon therefore, as the reversing piston has passed over and uncovers the exhaust port, the motion will cease, the steam will be exhausted, and the pressure of steam between the two reversing valves, *h*, *c*, will seat the upper valve and so cut off the supply of steam to the reversing cylinder.

As the steam piston approaches the end of its upward stroke the plate, *d*, will strike the lower projecting end of the reversing valve, *c*, and raise it from its seat. This valve is made a little smaller than its chamber: hence steam will pass down around it into the annular groove and through the steam port 9', into the opposite end of the reversing cylinder, whose piston will then obtain a reverse motion; and through the crank connection above described, will cause a reverse oscillatory throw of the main valves.

The main piston stem, as already stated, carries on its lower end the air-pump piston, *D*, fig. 4. Now extending along each side of the pump barrel is an air-pipe, *B' B'*, and these pipes are connected together at their ends by cross passages, 2', 2', cast in the heads or ends of the pump barrel. From one side-pipe an air-port, 3', enters the upper end of the pump cylinder, and prom the other side-pipe a like port, 4, enters its lower end, and in each side-pipe, just above and below each port, is a poppet valve, 5', 5', 5'', 5'', suitably seated and of such construction that when free to do so it will seat itself and keep its seat by its own weight.

An air-tight inlet port, *B*,'' is made in one of the side ports, at such point that the pressure of air entering thereat will always come against the under side of the valves, 5'', 5'', and an air outlet port, *B'*, is made at such a point that the ports or passages leading therefrom back to the valves 5', 5', will always strike their upper faces. From this outlet port an air pipe leads to the air reservoir. Then when the piston makes a downward stroke the effect is as follows:

1st. The air below is forced out at the lower port, 4'', into the space between the two lower valves, lifts the valve above and passes by the outlet port, *B*, through the pipe to the reservoir. At the conclusion of its stroke the same valve drops to its seat and acts as a check-valve to prevent a return flow of the air.

2d. External air enters at the inlet port, *B''*, into the side pipe; lifts the lower of the upper pair of valves; passes into the space between the two upper valves, and enters the pump barrel above the piston by the upper port, 3'.

As the piston makes an upward stroke the effect is as follows:

1st. The air above is forced out at the upper port, 3', into the space between the two upper valves; lifts the valve above and passes to the reservoir as above mentioned.

2d. External air enters as above stated, lifts the lowest of the lower pair of valves, passes into the space between the two and enters the pump barrel below the piston by the lower port, 4''.

This operation goes on continuously. By it the air is compressed to any desired degree of density and stored for use at pressure in a reservoir, *Y*, figs. 1, 2, 3, 19 and 20, made of boiler plate and attached to the locomotive frame directly under the foot-board by means of angle-iron plates, *Y*, *Y*, fig. 20. To ascertain the density at all times, any suitable pressure-gauge may be employed.

The brake cylinders, *W*, *W*, *W*, figures 1, 2, 14 and 15, are bolted to pieces of plank, *Q*', which are firmly fastened to the timbers of the car. These cylinders are shown in section in fig. 18. To the piston rod, *w*', is attached a sleeve, *w*, in which the connecting rod, *x*', figs. 14 and 15, moves freely. This rod is connected to a bell crank or "progressive lever," *X*, fig. 14. The lever is pivoted to a bracket, *P*, at *x''*. These brackets are bolted to planks similar to those to which the brake cylinders *W*, *W*, are attached. *Z*, *Z*, figs. 14, 15, 16 and 17, is a guide for the progressive lever and is bolted to the plank *Q*. *x'* is a rod connecting the progressive lever, to the common hand-brake lever, as shown in fig. 2. The hand brakes are not at all interfered with but are left as usual.

Underneath and extending the whole length of each of the cars and the tender are air pipes. Attached to these pipes at each end is a piece of rubber hose and coupling (which will be presently described) by which the air pipes of all the cars of a train are united with the air reservoir. Branch pipes are also attached at each end for the purpose of forming a double connection between the cars. By this arrangement it will be seen that the turning of the cars never interferes with the making up of a train.

When the engineer whistles to apply the brakes, he turns a cock, *M*, fig. 3, so as to allow the air to flow from the reservoir back through the air pipes into the brake cylinders, and in front of the piston in each. This causes the pistons to operate with an outward thrust, causing the brakes to be applied to the wheels.

To relieve or "let off" the brakes it is only necessary to close the reservoir cock and open communication from the air pipes to the external atmosphere, when the compressed air in the brake cylinders will escape, and the springs ordinarily used, or other spring device, such as is shown in the engravings, will cause the pistons to resume their former positions.

For the purpose of opening the connection from the reservoir to the brake-cylinder, and closing this connection and opening a connection from the latter to the external air, a single three-way cock, figs. 9 and 10, is commonly and advantageously used. This is arranged at such a point as to be under the control of the engineer, so that he can at pleasure turn on the compressed air with any desired degree of force, instantaneously or slowly, or with a varying power, and by another turn of the cock let it off as freely, still keeping it under the same complete control.

Another very important feature is the construction of the air-pipe couplings. It is, of course, an easy matter to couple two flexible pipes together so that they will remain intact so long as the cars of the train are not separated. It is important, however, in case they should be separated, that neither the couplings nor the flexible pipe should be broken, and that the air should not escape. If valves are employed to prevent the escape of the air, they should be self-acting, so that they will always be open when the hose are coupled and closed if they are separated by accident or otherwise.

The couplings employed are represented in section by fig. 12, and consist of a male, *U*, and female, *T*, the former entering the latter and kept tight with rubber or leather packing, *p*, *p*. The two are held together by spring hooks, *o*, *o*, which in ordinary use will hold them together, but which will permit of them being easily separated if any force is employed to pull them apart, or of being coupled if detached from each other. Each coupling is provided with a poppet valve, and each valve has a stem projecting from each face, which stems play through suitable guides in order that the valve may be seated and unseated with accuracy. The stems on the sides of the valves toward the open ends of the couplings are of such length that when the couplings are united, such stems will come together end to end, and each stem forces the opposite valve off from its seat, whereby an open passage way will be made for the flow of air through the couplings. When the couplings are disconnected, as in case of accident, the pressure of the air back of each valve will seat the valve and the brakes will be held down, even though the train becomes entirely broken up and each car disconnected from all the others.

It will thus be seen that provision has been made for almost every possible contingency, and that all the details have been worked out with the greatest care and ingenuity. The brake has already been applied to a great many roads and with remarkable success, and we feel justified in asserting that, up to the present time, it is the best automatic brake in use. The following experiments will testify to its efficiency:

At Chicago, November 26, 1869, tests were made on the Chicago & Northwestern Railway with the following results:

A train of six cars running at the rate of 32 miles per hour was stopped in 19 seconds, or seven car lengths.

The same train, at a speed of nearly forty miles, was brought to a stand still in eighteen seconds, running in that time about 370 feet.

These trials were made on a slippery track.

At a test on the Kansas Pacific Railway, May 12, 1871, a train going at the rate of 45 miles an hour was stopped within a distance of 250 feet.

On September 18th, 1869, a test was made in the presence of the Master Mechanics' Association, on the Pennsylvania railroad, at the famous "Horse-shoe Bend." The train of six cars, running down a grade of 96 feet in a mile, at the rate of 30 miles an hour, was brought to a stand-still in 420 feet—seven car lengths. At Altoona the train was stopped in less than its own length, in *eleven seconds*.

On the Pennsylvania Railroad an express train, at a speed of 45 miles an hour, was suddenly flagged and brought up in nine car lengths, just 80 feet from a train standing on the track.

On the Pittsburgh, Cincinnati & St. Louis Railway, an accommodation train coming around a curve down a grade of 58 feet, at the rate of 25 miles per hour, was brought to rest in a distance of 200 feet, and within 50 feet of a freight train, obstructed by the caving in of a tunnel.

This system of brakes has already been applied and is in daily use on the following roads:

Pennsylvania Railroad and branches; Pittsburgh, Cincinnati & St. Louis and branches; Union Pacific; Michigan Central; Lake Shore & Michigan Southern; Pittsburgh, Fort Wayne & Chicago; Jeffersonville, Madison & Indianapolis; Oil Creek & Allegheny River; Chicago, Burlington & Quincy; Philadelphia & Erie; Allegheny Valley; Cleveland & Pittsburgh; Burlington & Missouri River; Hartford & New Haven; Northern Central; Erie & Pittsburgh; New York & New Haven; Chicago & Northwestern; Illinois Central; Chicago, Rock Island & Pacific; Old Colony & Newport; Boston & Providence; Hudson River; Philadelphia, Wilmington & Baltimore; Central Pacific; Cleveland, Columbus, Cincinnati & Indianapolis; Kansas Pacific; California Pacific; New York & Philadelphia; Kansas City, St. Joseph & Council Bluffs; Indianapolis, Bloomington & Western; "Vandalia" Line; Ohio & Mississippi; Indianapolis, Cincinnati & Lafayette; Columbus & Hocking Valley; Morris & Essex.

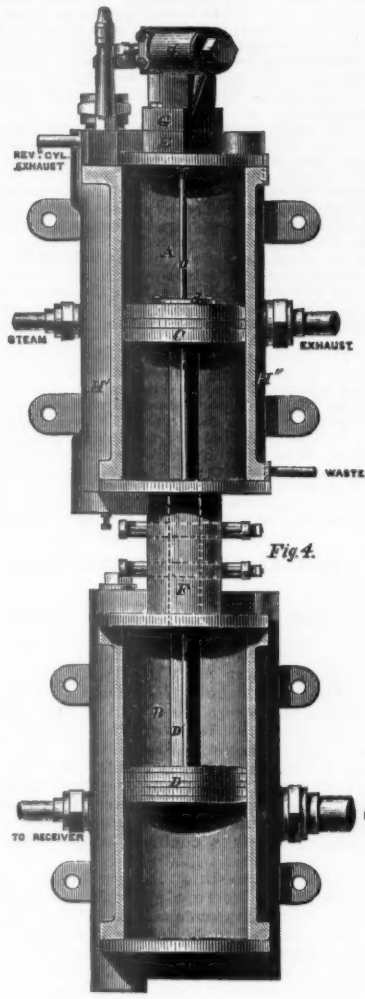


Fig. 4.

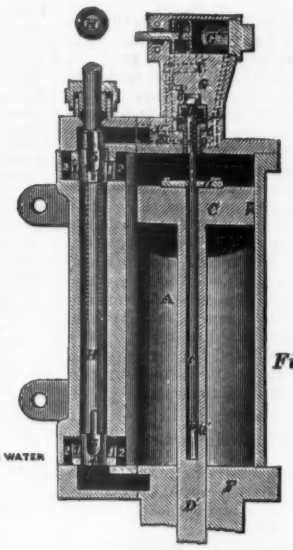


Fig. 5.

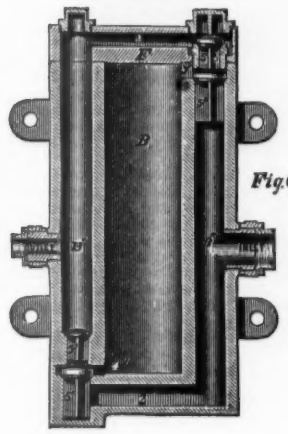


Fig. 6.

Fig. 7.

Fig. 11.

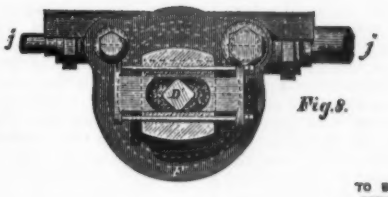
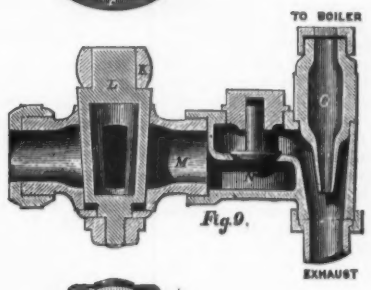


Fig. 9.



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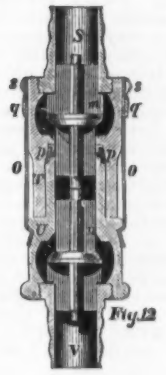


Fig. 12.

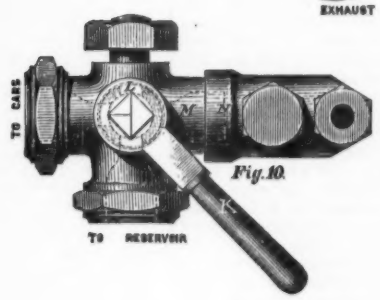


Fig. 10.

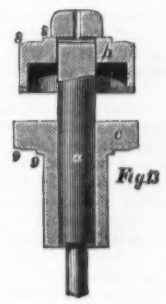


Fig. 13.

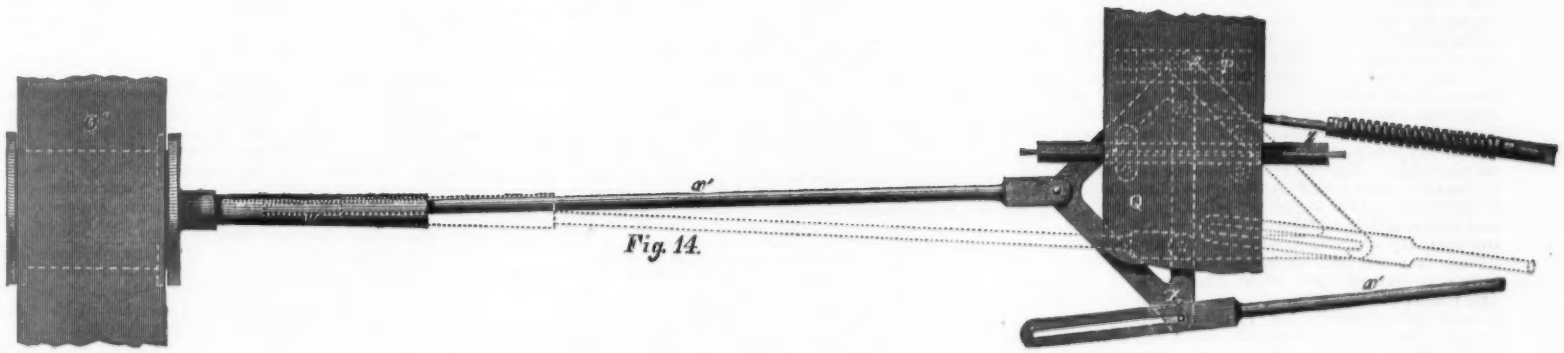


Fig. 14.

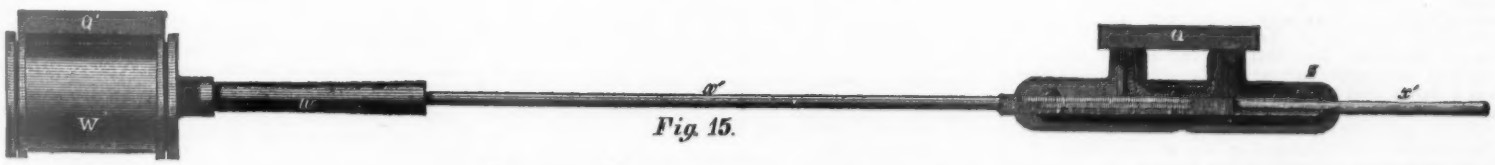


Fig. 15.

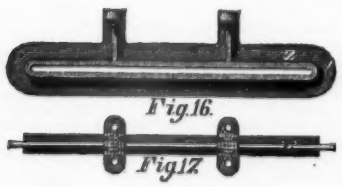


Fig. 16.

Fig. 17.

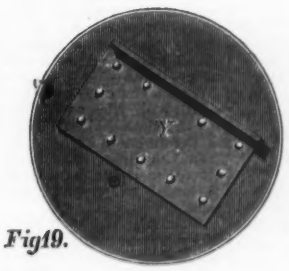


Fig. 19.

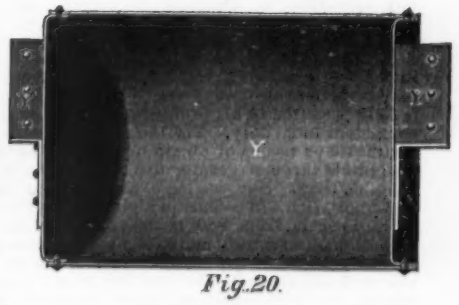


Fig. 20.

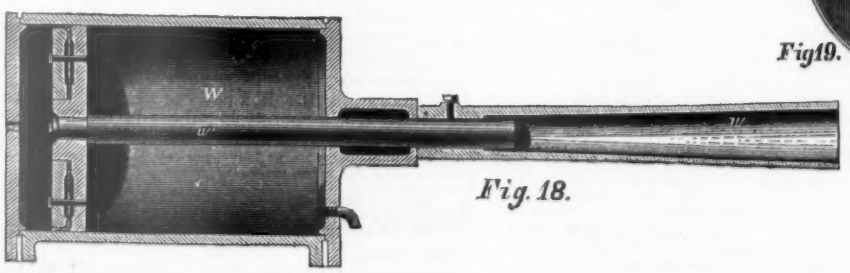


Fig. 18.

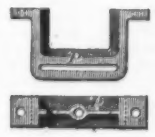


Fig. 21.

Fig. 22.

DETAILS OF THE WESTINGHOUSE ATMOSPHERIC BRAKE.

Fig. 1.—Side elevation of a railroad train, with the Westinghouse Brake.
Fig. 2.—Inverted plan of train.
Fig. 3.—End view of engine.
Fig. 4.—Sec. thro' air & steam cylinder of air pump
Fig. 5.—Section of steam cylinder of air pump, on line *j, j, j*, fig. 7.
Fig. 6.—Section of air cylinder of air pump, on line *j, j*, fig. 8.
Fig. 7.—Plan of steam cylinder of air pump.
Fig. 8.—Plan of air cylinder of air pump.
Fig. 9.—Section of three-way cock for admitting and releasing air to and from the brake cylinders.
Fig. 10.—Plan of same.
Fig. 11.—Plan of steam cylinder, with cover removed.
Fig. 12.—Section of hose coupling.
Fig. 13.—Section of reversing valves, for steam cylinder.
Fig. 14.—Plan of brake cylinder, bell crank, etc.
Fig. 15.—Side elevation of same.
Figs. 16 and 17.—Guide for bell crank.
Fig. 18.—Section of brake cylinder.
Figs. 19 and 20.—Air reservoir.
Figs. 21 and 22.—Rod *x*, figs. 14 and 15, for connecting the bell crank with the brake levers.

General Butler on Railroad Management.

In a speech at Lynn, Mass., on the 4th inst., General Butler, discussing the labor question, said:

The difficulty why we have not substantially absolute safety in railroad travel is applicable to the general system of railroad management and can be summed up in a single word. It is because the railroads are managed with a view solely to private profit and gain, and not for public convenience or safety, only in so much as that safety and convenience conduce to the private profits of the owners. As a rule nothing is ever done by a railroad management to accommodate the public except that which will draw the public into its cars. Nothing for safety is ever done, except only so far as the prevention of accidents may save the railroad treasury from their consequences, and even in that regard a very niggardly and heretofore a short-sighted policy is most often pursued. This is nowhere shown more distinctly than in the employment and payment of the engine driver or engine man who manages the train. Let us for a moment contemplate what are the qualities necessary in an engine driver to do his duty fully and efficiently. He must have, in the first place, experience and knowledge of his machine; how it may be put together, how taken apart; how any part may be supplied, and to know, theoretically as well as practically, all its powers and action. He must be punctual and exact, he must be faithful, he must be temperate, he must be possessed of great coolness and nerve and presence of mind to cope with an emergency; of courage to stand to his post; blessed with intelligence and with the keen eyesight of the sailor at the masthead. Add to all these the endurance and watchfulness that never slumbers. He is charged with a train having on board it may be a thousand lives, the most precious and valuable of all on earth. On the qualities I have enumerated and his excercise of them depend their safety; to his hand they are committed to be carried with lightning-like speed through a series of dangers. Subject to ever-recurring accident, the engine driver's duty requires more of the high qualities with which God may endow a man than are necessary in the Governor of a State. Indeed, if the engine driver fails in any one he may do more damage and cause more loss of life and property than the Governor of a State can do during his year's administration. Should not such a man as I have described, charged with such high interests, requiring the highest qualities, receive the greatest reward for his labors? Especially when we take into consideration that in addition to all this his occupation deprives him of the comforts of home, with wife and children, and he perils his own life every hour, because if any accident happens his is the post of exposure, and if he escapes the danger of collision or from being thrown from the track, it is only to meet the still greater danger of investigation and a charge of criminality with his late employers interested to throw upon him a blame which would otherwise attach to them. Besides, experience shows that the constancy of his occupation wears him out in a short period of years. Now, then, the safety of travelers upon the railroad requiring all these high qualities, it becomes the duty of railroads to provide them. How is that provision made? It is sufficient for either buyer or seller that the ordinary and cheap article of merchandise may be weighed in the ordinary and common scale. If hay is weighed on a scale that will turn the beam with a loss of pounds only it is enough; but when one deals in diamonds and jewels the scale must turn on a knife edge supported on agate. The railroad management are dealing with the most valuable thing on earth, human life and limb. They are bound to deal with it as carefully as does the jeweler with the emerald and the diamond. Is there any standard by which the competency of an engine driver may be judged? Is there any school for instruction? Is there any board to know his qualification? Not that I by any means desire to say that mere qualifications of education are sufficient, but to know that a man has the qualities, the steadiness, fidelity, punctuality and presence of mind which are the great necessity of his profession. Has the State thrown any safeguard by law around human life in its network of railroads in this regard? Has it made any qualification whatever necessary? No! All is trusted to the railroad management. But the laws applied to conveyance at sea by no means leave the qualifications of the pilot to chance. No pilot shall take into Boston harbor a valuable cargo, although there may be be no substantial risk to human life, unless he is fully prepared in his profession and certificated to be competent to do duty. Yet the law has provided no certificate or means of obtain ng one by the engineer who pilots through greater danger thousands of most valuable lives. Nay, we have not even the safeguard that high price will command high talent. The price of an engineer is from $80 to $90 a month among the highest class—scarcely more than a gentleman pays his gardener to take care of his fruits and flowers—and yet he daily commits his own life to the care of one needing the high qualities I have described, who receives the same pittance. When I have seen superintendents, ticket agents and other employes of the road receiving high salaries I have thought how terribly necessary it was that all this should be reversed. We pay the lowest clerks in our departments at Washington, the commercial inspector of our Custom-House, whose only duty it is to count the number of buckets of salt or coal that are brought in a foreign ship, more than we pay our first-class engine drivers on the railroads, into whose hands we trust our property and our lives. Now, is it to be said that the railroads are to be suffered to manage their own affairs, unregulated and unrestrained by law, when in a series of years they themselves belittle the office of the engine-driver and keep him—it would almost seem because he is a working-man and a mechanic—upon a mere pittance, when the superintendent and the president, if economy require a reduction, should have had the pittance, and the engine-driver the high salary, if he is fit for his occupation. Indeed, in my judgment, the conductor, the fireman, the engineer and the brakeman of the train should have the highest paid salaries on the road, as having the most responsible positions, if the men are fully capable of filling them. Again, let me not be misunderstood. I by no means desire to arraign or believe the managers of the Eastern Railroad to have been more at fault as men than the general system of railroad management would cause them to be; but I do mean to say that the average standard of American railroading is not up to the requirements of the public in insuring the convenience and safety of the traveling public. Sweep away the gilding and upholstering from your car—the gold and silver lettering, mirrors and paintings—give us plain, substantial, comfortable cars, and put the price of the gildings, the mirrors and upholstering into the salaries of the firemen, the brakesmen, and the conductor and the engine driver. Give us less show and more saftey, and let the laws of the State enforce the latter, and leave the former only to the enterprise or taste of railroad management.

Inspection of Steamboat Boilers.

The Board of Supervising Inspectors have issued the rules and regulations recently decided upon for the examination of steamboats. Those which relate chiefly to the engines and boilers are as follows:

Rule 1. Certificates of inspection signed by one local inspector only shall not be considered valid, nor shall the name of a regular inspector be substituted by that of any other person upon any such certificate. This rule also applies to licenses of pilots and engineers.

Rule 10. After applying the hydrostatic test to the boilers, the strength of which is owing, in part, to the internal bracing, the inspector shall carefully examine the interior thereof, to ascertain the character and condition of such bracing, and to see what weakness or fracture, if any, may have been disclosed by said test.

Rule 33. Whenever steamers use a pressure upon their boilers exceeding sixty pounds to the square inch, they shall be inspected as high-pressure steamers, and designated as such.

Rule 34. All steamers on Western rivers which have their boilers so situated that sparks from the fires may be driven back among the freight or other combustible material, shall have a sheet-iron fender extending forward from the fire-doors not less than two feet at the height of the furnace-fronts, and connecting with the same.

Rule 35. Before a license can be issued to any person to act as a master, mate, pilot, or engineer, he must personally appear before some local board or a supervising inspector for examination according to law.

Rule 37. Safety-valves, attached to the boilers of all steam-vessels hereafter built, shall have an area of not less than twenty square inches for 500 feet of effective heating surface (half the flue and all other heating surface being taken as effective), and shall be so arranged that each boiler on the steamer shall have one separate safety-valve, unless the arrangement is such as to preclude the possibility of shutting off the communication of any boiler with the safety-valve or valves employed. This arrangement shall also apply to lock-up safety-valves when they are employed.

Rule 38. One or more of said safety-valves may be taken wholly from the control of all persons engaged in navigating such vessels, and secured by the inspectors; that said safety-valves for the boilers of the smallest vessels shall in no case be less than two inches in diameter, and for larger vessels shall be of such dimensions as shall be deemed by the supervising inspector of the district necessary and proper for the boilers of such vessels, provided that in no case shall the lock-up safety-valves have an area of less than fifteen square inches for every 500 feet of effective heating surface.

Rule 39. The lock-up safety-valves herein provided for shall, in their mechanism, employ but one lever, or a spring-loaded valve, and must be provided with means to relieve the valve of its pressure from the outside, and that the valves, valve-seats, valve-chambers, pins, and guides to the spindle of the valves, shall be made of composition composed of copper and tin, and that the valve shall be guided to its seat, both above and below, and that the case shall be so constructed as to preclude the possibility of obstructing the working of it either from the interior or exterior of the boilers, one or more of which kind of valves shall be attached to the boilers of all steamers hereafter constructed.

Rule 40. All steamers now in service, and which are now supplied with lock-up safety-valves, in conformity with the regulations of the former Board of Supervising Inspectors, shall be deemed to have complied with the law relative to lock-up safety-valves.

Rule 41. All high-pressure steamers shall have inserted in their boilers plugs of Banca tin, in the following manner, to-wit: Cylinder boilers with flues shall have one plug inserted in the top of one flue in each boiler, and also one plug inserted in the shell of each boiler from the inside, immediately below the fire line, and not less than four feet from the forward end of the boilers. All fire-box boilers shall have one plug inserted in the crown of the back connection.

Rule 61. Every plate used in the construction of boilers for steamers shall be stamped in the following manner, viz., at the diagonal corners, at a distance of about four inches from the edges, and also about the middle of the sheet, with the name of the manufacturer, the place of manufacture, and the number of pounds, tensile strain, it will bear to the square inch.

Rule 67. All steam registers shall be so constructed as to be operated wholly by the pressure of steam in the boilers to which said steam registers are attached; that their mechanism shall be enclosed in a metal case, so arranged as to preclude the possibility of its being interfered with from the outside, and be secured by a lock or such other device as the Board of Supervising Inspectors shall approve; said steam registers shall be provided with a suitable stop-cock to shut off the steam from the register in case of necessity, and said stop cock shall be so placed and arranged as to be secured or locked by the same device or lock employed to secure the register from the interference of unauthorized persons. The front or face of all registers shall be of heavy glass, so as to enable passengers and others to observe at all times the pressure of steam. The number of times the working pressure allowed has been exceeded, and the highest point attained, may be registered either upon a continuous strip of paper under a pencil moved by the variations in the pressure of steam, or by hands or pointers, moving over a dial-plate or plates, arranged and graduated for that purpose.

Rule 68. Steam registers recording to the number of times the working pressure has been exceeded by a graduated dial-plate or plates, with hands or pointers moving over the same, shall be so constructed as not to necessitate the pressure of steam falling to exceed two and a half pounds below the working pressure, in order to record the next excess. And all steam registers shall be so constructed as to record each excess of more than two and a half pounds above the working pressure allowed for low-pressure boilers, and five pounds above the working pressure allowed for high-pressure boilers. And each steam-register attached to either high or low-pressure boilers shall be capable of recording ten pounds above the test pressure.

Rule 69. All steam-registers shall be placed in conspicuous places, under the direction of inspectors, who shall also prescribe the manner in which steam-registers shall be attached to boilers or steam-pipes.

Rule 70. It shall be the duty of all inspectors before issuing a certificate af inspection to any steamer, to ascertain by actual test that the steam-register required by law is in accordance with the foregoing rules.

Rule 71. Feed-water shall not be admitted into any low-pressure boilers at a less temperature than 100 degrees, and shall be so admitted in all cases above the fire box, and under no circumstances shall cold water be admitted into any boilers while hot on board steamers within the jurisdiction of this board.

Rule 72. Feed-water shall not be admitted into any high-pressure boiler on board of any steam vessel within the jurisdiction of this board at a less temperature than 180 degrees.

Rule 73. It shall be the duty of all inspectors to immediately suspend or revoke the license of all engineers who shall wilfully violate either of the above rules; and inspectors shall in all cases, before granting certificates of inspection, know that steamboats are supplied with suitable appliances for heating said feed-water to not less than the prescribed temperature, when the main engine or engines are not in motion, and the feed is supplied by doctors or donkey pumps.

MECHANICS AND ENGINEERING.

Steam on Canals.

The Buffalo *Commercial Advertiser* describes as follows a boat which recently on a trial trip brought 160 tons of coal from New York to Buffalo.

"The *Cathcart* was built in Washington, D. C., in 1869, and has been running for a length of time on the Schuylkill Canal where she is said to have been quite successful. She is 98 feet over all, 17½ feet wide, 8½ feet hold and registers 93 63–100 tons. Her carrying capacity, exclusive of fuel and water, is 175 tons. She is provided with a high-pressure boiler, 16 feet long by 4½ feet in diameter, of the locomotive pattern. The engines are 12x12 inches, and also high pressure. The propelling power is a common screw wheel in her stern.

"The most interesting feature of the *Cathcart's* machinery is the steering apparatus, which worked admirably. The improvement consists of a moveable joint on the shaft of the propeller, outside of the stern-post of the boat, by which the propeller can be moved laterally by a standard coming up like the rudder-head to the deck of the boat. On this is fitted a semi-circular yoke about five feet long, to each end of which is a chain fastened, the bugles passing around a wheel about a foot in diameter, which is fastened to the rudder-head, and fitted with cogs to catch the links of the chain. Thus the direction of the rudder and propeller are changed simultaneously, at the will of the helmsman. When going straight ahead, the direction of the rudder and wheel are on a line with the keel. But as the rudder is moved, the pressure of the wheel is shifted to the quarter, making the propelling power an aid to the rudder in steering the boat. With this arrangement a very slight deflection of the rudder produces a considerable change in the direction of the boat.

Cost of Constructing a Telegraph Line in Nebraska.

We are indebted to Mr. F. W. D. Holbrook, Assistant Chief Engineer and Assistant Superintendent of the Burlington & Missouri River Railroad in Nebraska, for the following very interesting detailed account of the cost per mile of the telegraph line of that railroad:

26 poles, at $1 each in Chicago	$26 00
Freight on same	22 10
Wire, 2 coils to the mile, 190 lbs. to the coil, 9 cts. per lb.	34 20
Freight on same from Boston, Mass.	3 68
26 brackets at 5 cents each	1 30
26 glass screw insulators, at 10½ cents each	2 73
Cost per mile for setting posts, stringing wire, etc.	11 35
Cost per mile of line without furnished office	$102 86
Cost per mile of battery, office apparatus and instruments	7 10
Total cost per mile in running order	$109 96

Necessary apparatus for one telegraph station—way and general:

1 switch and lightning arrester	$5 45
1 key	5 25
1 box relay	15 06
3 lbs. gutta-percha copper wire	4 80
1 telegraph table	10 00
Cost of way-station outfit	$40 56
1 Hill battery, 50 cups, at $1.50	75 00
1 pair climbers	3 50
1 battery pump	3 00
1 " hydrometer	75
Terminal or general station outfit	$122 81

Outfit for six men and foreman constructing telegraph line in the field:

1 pair climbers,	1 pair pliers,
1 " pulleys,	1 10-inch auger,
1 tramping bar,	1 spade,

1 coil wire to every 13 poles, 2 coils to the mile.

In ordinary prairie soil, a party of six men and foreman, as above, will operate as follows in the field, putting up line:

2 digging holes, 120 holes, or 5 miles per day.
2 setting poles, 312 poles, or 12 " " "
2 stringing wire, 8 miles per day.
Men digging at $2 per day.
Men stringing wire, *i. e.*, climbers, $3 per day.
Foreman, $75 per month.

The Buffalo Bridge.

An exchange paper says of the International Bridge now building for the Grand Trunk Railway at Buffalo:

"Negotiations have been opened with the Great Western Railway of Canada, with a view to having that road take an interest of one-half in the bridge. The London directory of the latter road, anxious to know that the investment will be a safe one, commissioned Capt. James B. Eads, Mr. E. S. Chesbrough, of Chicago, Engineer of the Detroit Tunnel, and Mr.

George Lowe Reid, Chief Engineer of the Great Western Railway, to visit the bridge and report upon its safety, solidity, design, etc. After visiting the bridge these gentlemen met in St. Louis, and during the last four or five days have been engaged in the preparation of their report. The report has been forwarded to Mr. Joseph Price, Treasurer of the Great Western Railway, at Hamilton, Ontario, and will be by him at once sent on to London. The contents of the report are not known, but it is believed to be unfavorable to the bridge, and to suggest important alterations in the design, to insure its safety against the action of the heavy ice usually formed on Lake Erie."

The Westfield Explosion.

Under the head "A Plain Case," an exchange says:

"The explosion of the boiler on the Westfield has been attributed by the experts and the inexperts to the following causes, viz:

To over-pressure of the steam.
To the superheating of water.
To low water.
To ignition and explosion of gas.
To superheated steam.
To over-straining under the hydraulic test.
To bad iron.
To bad workmanship.
To patches.
To general debility from old age.
To the absence of longitudinal stays.
To a flaw in one of the sheets.
To the ignorance of the engineer.
To the cupidity of the owners.
To the improper manner of supporting it on the saddle.
To unequal expansion and contraction."

There is one other reason for the Westfield explosion which is not given above, which is, that the boiler was not strong enough.

Northern Pacific Survey.

A correspondent writes from Silver Star, Montana, under date of August 23: "On page 217 of the RAILROAD GAZETTE you published Mr. Morris' announcement that 'Division No. 1 will proceed to Fort Ellis toward Yellowstone River.' This has since been changed, and Division No. 1 began their survey at the headwaters of the Missouri—where the Jefferson, Gallatin and Madison rivers unite to form the Missouri—and continued on the north side of the Jefferson River, up the Jefferson Valley, in a general southwesterly direction. The party met but one serious obstacle, the Jefferson Canon, which is about five miles long, and which was passed after a great deal of labor and difficulty. Silver Star—where the party now is—is fifty-two miles from the starting point. In this distance the grade at no point exceeds twelve feet to the mile. The elevation of the starting point above the sea level is about 4,500 feet. At this place we are about 600 feet higher.

"Division No. 3 began its survey from the same stake as Division No. 1, and, crossing the Jefferson River, followed for some distance up the Gallatin Valley, and are now on their 45th mile. They have had no trouble from Indians, and, as soon as they reach Fort Ellis, will have an escort of 110 men. Division No. 2 is, I understand, doing well, though I learn nothing definite from them. Division No. 4 is on its 50th mile of survey, just at the mouth of Bear Creek. By the first week in August these parties will have surveyed, in the aggregate, about 250 miles. Since we started, a fifth party has been organized and is at work at the Red River.

"Our Chief Engineer, Col. W. Milnor Roberts, started, on the 11th of August, for Corinne, Utah, to escort a party of German engineers and agents of German capitalists from there across the country to the Pacific coast."

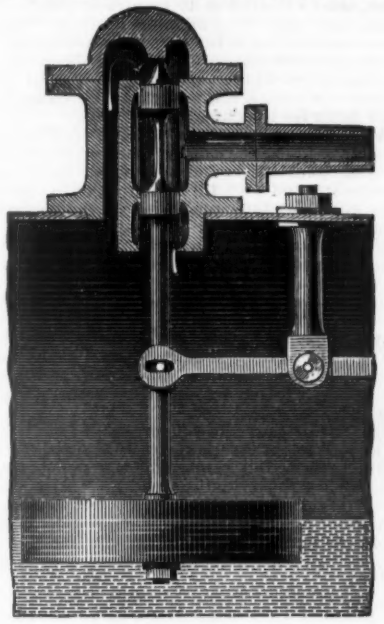
Saco River Bridge.

The new iron bridge of the Portland & Ogdensburg Railroad, over the Saco River, at Conway Center, Me., was completed and tested last month. A correspondent of the Boston *Journal* gives the following account: "The bridge rests upon three piers. Its length is 316 feet, width 18, and height 28, and the structure stands at the track about 40 feet above low water in the river below. Each span is divided into 11 panels of 14 feet 2 inches between centers. The rolling load provided for is 2,500 pounds per lineal foot of structure in addition to its own weight, including track, which will not cause a strain exceeding 10,000 pounds per square inch sectional area upon the parts in tension, being only one-sixth of its ultimate strength. The capacity of the bridge is 9,400,000 pounds, without a deterioration of material. The test was applied at 11 o'clock by placing three locomotives loaded on each span. This gave a weight of over 150 tons. No possible accumulation of weight in any train of cars could at all approach this. Mr. E. R. Blackwell, of the firm of Clarke, Reeves & Co., Phœnixville, Pa., builders of the bridge, mounted the first engine, and thus rode on to the great test. By his side stood Gen. Anderson, President of the road, and John Anderson, Esq., Chief Engineer. The deflection under the extreme pressure was one inch. This was less than was expected, and the test was eminently successful."

Preventing Boiler Explosions.

The following description of a recently-patented method of preventing boiler explosions will, doubtless, interest your readers. It is the invention of M. Langlet, a Belgian, and, as will be seen from the engraving, acts as a low-water detector and self-feeding apparatus combined. On the top of the boiler is fixed a valve chest, in which works a valve opening inward. Attached to the valve chest is a pipe, through which, when the valve is opened, steam is conveyed to the injector or pump. At the lower end of the steam valve is a rod, extending downward, and connected with a float resting on the surface of the water, and partially supported by a balance weight attached to one end of the lever, which is held up by a bracket, and connected loosely with the valve and float rod, so as to offer no resistance to the vertical rise and fall of the valve. When the level of the water in the boiler is at the proper height the valve remains closed, but as the level of the water falls the float falls with it, drawing down the valve, which then opens, and allows steam to pass to the injector or feeder and to force water into the boiler, thus raising the level of the water to the proper height, when the float, by rising, closes the valve.

The figure represents in longitudinal vertical section part of a steam boiler with the apparatus applied to it. The valve chest consists of an inner cylindrical chest, in which works a double piston valve, and of an outer casing cast with the chest, and forming with it a channel through which steam from the boiler is admit-



ted into the upper part of the chest when the valve is open. The valve chest and casting are closed at top by a cover, as shown, and the piston valves fit accurately the plain cylindrical parts of the valve chest, so as effectually to close the passage of steam when in the position represented in the figure; but part of the interior of the valve chest is corrugated or grooved, to allow the passage of steam when the valves are pulled down by the falling of the float The arrows show the course of the steam when the valves are open, and the figure is, I think, sufficiently explanatory not to require further description. To save space, I have left out the weight at the end of the lever.—*Correspondence English Mechanic.*

Accidents to Railway Structures.

From a paper read before the American Society of Civil Engineers by Mr. Thomas C. Clarke.

Railway accidents may be roughly classified as follows:

I. *Running off the track* from breakage of parts of engines or cars; breakage or displacement of rails; malicious or accidental obstructions on the track.

II. *Collisions* from disregard or misunderstanding of signals; overcrowding from badly arranged time-tables; misplaced switches; accident to train on one track, throwing it in the way of train on the other.

III. *Failure of structures* from decay or original bad design; shocks from breakage of machinery, causing trains to run off track while crossing, or from collisions on bridge.

It has been observed that the most disastrous accidents have resulted from an unforeseen combination of two or more of the above causes. The late appalling accident on the Hudson River Railway is an illustration of this, as it was a combination of all three of the above principal causes.

The primary cause was the breaking of the axle under the oil car. According to the evidence of Mr. Toucey, Superintendent of the railway, broken axles have been known to run twenty miles before being discovered, "the frozen ground keeping it up; in this case it evidently dropped through the bridge." The second cause, therefore, was failure of a structure from shock caused by breakage of machinery. This threw the car from one track over upon the other, and a collision resulted, aggravated in its consequences by the presence of petroleum, and from its being upon a wooden structure which quickly burned down.

Much severe criticism has been passed upon the company, because the "safety-signal," as it is said, "lured the train to destruction." It appears to have been overlooked that the same unhappy result would have followed if the signal lamp had been entirely removed, when winter changed the bridge from a moveable draw to a fixed structure. Moreover, a collision would have taken place on a fixed bridge where there never was any signal if the broken car had happened to cross one. In fairness to the employes of the railway, the accident should not be attributed to a disregard or a misunderstanding of signals. The combination of a broken axle, a bridge, a car laden with petroleum, an express train coming up at the same moment, were all required to cause this truly dreadful event.

The object of the present paper is merely to consider one of these points, and to discuss the questions, whether bridges as now constructed are sources of danger, and, if so, can the chances of accident therefrom be reduced by different forms of construction?

It is believed that there is no instance of a bridge, designed by an American civil engineer, having broken down from bad design, or insufficient material, as did the Dee Bridge in England, designed by Robert Stevenson.

All the bridge accidents in this country, it is believed by the writer (and if mistaken he hopes some member will correct the statement), have occurred either from the falling of temporary trestle work, or from weakness caused by decay, or from sudden shocks occurring when trains have run off the track. Our bridges, both of wood and iron, are safe so long as the trains remain upon the track. How many of them are absolutely safe under all circumstances? If not, how can we make them so? or at least diminish the chances of accident? This is the practical question.

It was a practice in English bridge construction, introduced by Brunel, and now falling into disuse, to make the platform of a bridge in the shape of a trough which was filled with gravel or broken stone ballast, and the ties laid in it, just as on earthworks.

The reasons given by Mr. Brunel for this were as follows:

1. To enable the alignment and level of the rails to be maintained by the same men and with the same tools as on other parts of the line.
2. To prevent concussion when a train came upon a bridge, as there was no change in the nature of the support given the rails.
3. To prevent vibration being transmitted to the iron-work of the bridge.
4. In case of trains getting off the rails, to prevent their plowing through the flooring.
5. To protect timber flooring from fire.
6. To provide for changes of length caused by temperature.
7. To increase dead weight on short spans so that there might be no jar from the rapidly applied load of a locomotive.

It was Brunel's belief that the cost of the extra material required to support the ballast was more than compensated by the above advantages.

Most American engineers would say that the first object was of little consequence; that the second and third are equally well provided for by a wooden system of flooring; that to use ballast for the fifth would do more harm than good, because the timber and plank would rot unseen; the sixth can be accomplished more easily in other ways; and that the seventh had better be attained by making the iron-work heavier. The fourth, that of preventing trains plowing through the floor, ought to be accomplished at any cost. But let us examine if there is not a better way.

The weight of the ballast itself averages about 500 pounds per foot run, and that of the additional parts of platform necessary to support it about 500 pounds more. In other words, it weighs as much as the iron-work of an American truss bridge of 150 feet span, or an English plate girder of 110 feet span. This great addition of dead weight has prevented its adoption here, and caused its disuse in England. The object which it was intended to accomplish was excellent, and it is to be feared that this has been too much neglected in the rough and ready style of construction adopted in our earlier bridges at least.

If the train jumps the track while crossing, it falls through a space equal to

The height of rail	4½	inches.
" track-stringer	12	"
" cross-tie	5½	"
	22	inches

in all upon the floor beams, which, in most cases, would either be broken outright by the shock, or crowded apart by the wheels of the engine, so that it would drop through the bridge.

The arrangement of platform on most iron bridges is still more dangerous, as the floor beams, though of iron, are placed in pairs together, and from 10 to 15 feet apart, so that there is nothing to prevent the engine from dropping between them if it once leaves the rails.

There is a mode of construction which is in use upon some of the Pennsylvania coal roads, which is much better provided to secure safety in the case of trains leaving the rails. The track stringers are numerous, and are strong enough to resist a severe shock. The ties are made of 4x12 inch plank, on edge, placed 6 or 8 inches apart, and blocked between every one, both at each end and under the rails. It will be observed:

1. That the distance that the wheels can fall cannot exceed the height of the rail, or 4½ inches.
2. That the platform is broad enough to support the wheels even if the train is off the track.
3. That the ties are so close that the wheels cannot drop between them, and being firmly blocked, cannot be crowded apart so as to leave a space through which a car or engine may fall.

In addition to this, there should be heavy guard timbers on each side, to prevent the engine striking the trusses of the bridge before its motion is arrested. There should also be a few planks spiked together lengthwise, so as to support the track in case of an axle or wheel breaking.

If such an arrangement does not insure perfect safety, it certainly diminishes the chances of danger far below those which are inseparable from the style of construction which it is believed is commonly used in this country.

As the one object of bridge building is to insure the safety of what is carried across the bridge, it would seem desirable that some of the superfluous talent which fills our engineering papers and magazines with elaborate calculations upon the strength of the parts of the main trusses of bridges, none of which were ever known to fail, should be diverted to drawing the attention of railway managers to a safer construction of the floor system than now prevails.

RAILROAD LAW.

The Case of the Covington & Lexington Railroad Company vs. The Bowler Heirs.

We have received from Mr. Peter Zinn, President and counsel for the company, the appellant's brief in this case, which covers such vast financial interests and involves so many important points of railroad law. The brief is lengthy and exhaustive, and very fully treats of the entire law of trustees. The points in the case, most briefly stated, are as follows:

This suit is to recover the Covington & Lexington Railroad, by the corporation which built it and ran it up to October 29, 1859, when it was sold by foreclosure proceedings in the Fayette Circuit Court. This suit was brought September 30, 1865, the petition alleging, substantially, that no necessity existed for allowing the road to be brought to sale; that the company had the means to pay all its debts demanding payment, and a valuable road, which R. B. Bowler, now deceased, and then a director, with the connivance and assistance of other directors, purposely embarrassed and fraudently brought to sale, that he and others, or himself, might become the purchasers and owners; and that, while directors and trustees of the company (the plaintiff) they thus did become the purchasers of the road. The prayer is to charge Bowler's heirs, representatives, and assigns as trustees for the plaintiff, and for judgment of reconveyance of all interest derived under the sale, to the plaintiff; for an account of the profits of the roads (in which Bowler should be limited to the cost price of his purchases of claims against the road, made by him after he became director, and was placed in a confidential relation to the plaintiff, or purchased after the sale of the road to prevent suit); and for general relief.

Negligence.—What does not constitute negligence—Liability of parents for the negligence of young children.

In the case of *The Pittsburgh, Fort Wayne & Chicago Railway Company vs. Brumstead*, involving, among other points, the liability of parents for the negligence of young children, the Supreme Court of this State say, as to the latter point:

"We cannot perceive, admitting it is a duty of the most imperious obligation resting upon parents, to use vigilance in the care of their offspring of tender years, that the parents of this child were wanting in this requirement. A mother cannot be always, at all hours, with her child, nor is there any necessity she should be, nor is it practicable. She must perform her accustomed avocations; and in one moment a child of four years of age may escape from her notice; it cannot be otherwise. The parents of this boy, the evidence shows, were in a very humble walk of life, who had, the mother especially, something more important to do than watch her child, lest he came to harm. She had to contribute her labor to feed and clothe him, and it is unreasonable to demand she should have no other employment than to guard her child from danger. Leaving the child with his sister, a girl of fourteen years of age, and who appears, from her testimony, to be intelligent and affectionate, was not negligence. It was unavoidable, and she was trustworthy and competent to take the charge of the child. What would be the public judgment of a rule of law which would forbid a mother to leave a child four years of age with his sister of fourteen, while their mother was providing for their sustenance, or enjoying herself by a short visit to a neighbor? Such a rule would not receive the sanction of any court, and is not to be found in any adjudged case, or in any legislative enactment, and has no reason in its favor. There was no negligence of the mother, and the child was in a place where he had a right to be, and at a safe distance from the railroad track."

New Proviso by a re-organized Railroad Corporation.

In the same case it was also held that: "Where the property and franchises of a railroad corporation have been sold and conveyed under a deed of trust given to secure a debt of the company, and the purchasers re-organize to prove a new promise by the re-organized company to pay a debt owing by the company as originally organized, there must be shown some action on the part of the directors of the former from which the promise can be clearly inferred. The mere certificate of their secretary that the amount was due on specified items would be insufficient to prove a new promise, or to bind the company, unless it appeared he had been empowered to adjust the claim."

Fire Policy—Construction of the words "contained in."

A policy was taken out by a railroad company on cars *contained in* car house No. 1. and on engine contained in engine house No. 2. The cars were destroyed and the engine greatly damaged by fire while making a regular trip. Held, that the words *contained in* were designed to limit the risk of the insurance company to the time during which the cars and engine were actually in the car and engine houses, and that having been injured when out of the car and engine houses, no recovery could be had on the policy.—(*Annapolis & Elkridge Railroad Co. vs. Baltimore Fire Ins. Co.*) To appear in 32d Md. Rep.

Railroads—Of their liability as warehousemen for baggage of passengers.

The following is from the decision of the Supreme Court of this State in the case of *Chicago, Rock Island & Pacific Railroad Company vs. Wm. H. Fairclough*, recently decided:

When a passenger upon a railroad purchases his ticket, and checks his baggage to the place of his destination, and such baggage arrived at its destination, and is not, from any cause, delivered to such passenger, or to his agent, *it was held* that it was the duty of the company to deposit such baggage in their baggage-room, in which event their responsibility becomes that of warehousemen, and they must respond in damages for any neglect in that capacity.

It is not necessary that such a place of deposit should be absolutely fire-proof, or burglar-proof, but such a place as a man of ordinary prudence would use for the storage of his own goods.

Liability of Railroad Companies for Injuries to their Servants Occasioned by Dangerious Structures—Release, what will constitute.

In the case of *The Illinois Central Railroad Company vs. William F. Welch*, some very interesting questions have just been determined by the Supreme Court of this State, as follows:

"In an action against a railroad company for injuries sustained by the plaintiff, while in the service of the company as a brakeman, the evidence showed that the injury complained of happened while plaintiff was engaged in the discharge of his duties, by collision with a projecting awning from one of the station houses on defendant's line of road, whereby he was knocked off the car, and so injured as to require amputation of his left arm; and that the dangerous position of this awning was well known to the division superintendent and division engineer, whose attention had been called to it a long time prior to the accident: *Held*, that this was negligence of such a character that the company must be held liable for the damages sustained."

2. As said by this court in the case of *The Chicago & Northwestern Railroad Company vs. Swett*, 45 Ill. 201, railroad companies are bound to furnish their servants safe materials and structures, and must, in the first instance, construct their road with all the necessary appurtenances.

3. *Same—must keep in proper repair.* And they must be kept in proper repair; and a person entering the service of a railroad company has a right to presume that in these respects it has discharged its obligations.

4. *Same—perils of the service—to what extent assumed.* A person engaging in this service assumes the ordinary perils of railroad life; and also special dangers arising from the peculiar condition of the road, so far as he is aware of their existence, and his exposure to them would be his voluntary act.

5. But in this case, the danger was of such a character as well might escape the observation of a person who had been in the employ of the defendant for a long period of time; and there is no reason for supposing that the plaintiff had acquired knowledge of the unsafe condition of this awning before his injury, as he had been but two months upon the road, and, except upon two trips, had always passed this station in the night.

6. *Cause of action—release of—what amounts to.* And in such case it was error for the court to instruct the jury that the following instrument, executed by plaintiff, did not release the cause of action in this case:

"Received of the Illinois Central Railroad Company $40, in full payment and satisfaction for *one month's time, in April, while laid up with injuries received while breaking*, and in full satisfaction of all claims, demands, damages and causes of action against said company, hereby forever releasing said company therefrom, as witness my hand and seal, upon this 5th day of *June*, A. D. 1866. W. F. Welch." [seal.]

7. *Same—release procured by means of false representations—no bar.* But if the plaintiff was induced to sign such release, by representations that covered merely a month's time, or wages, or if he signed it under such a belief, induced by the words or acts of defendant's agents, it would not operate as a bar, and this question should be left to the jury.

8. *New trial—excessive damages.* And in such case a judgment for ten thousand dollars damages must be pronounced excessive; not the slightest foundation for vindicative damages existing.

Subscriptions in Aid of Railroads.

The Supreme Court of Wisconsin, in an opinion delivered in *Phillips et al. vs. The Town of Albany et al.*, at the June term, 1871, says the power of the Legislature to authorize municipal subscriptions to the stock of railroads is settled by former decisions in this State, as well as in other States, though the majority of this court would be disposed to deny the power if it were a new question.

Papers on Iron and Steel.

BY W. MATTIEU WILLIAMS.

V.—THE BESSEMER PROCESS (CONTINUED.)

In the previous papers I have described the phenomena presented during the different stages of the blow, and have endeavored to explain the chemical actions upon which they depend. The next stage, that of adding the molten spiegeleisen to the iron which has been fully acted upon by the blast, also presents some interesting phenomena which have not hitherto been fully examined.

In a paper on "Burnt Iron and Burnt Steel," read before the Chemical Society 6th April last, I showed that the "burnt iron" of the workman is really what its name implies, viz., iron which has been more or less oxidized throughout its substance, and that "burnt steel" is quite different—that the presence of combined carbon in sufficient quantity effectually protects iron from oxidation by heat.

These conclusions are strikingly illustrated in the Bessemer process. In spite of the excessively high temperature and the abundant supply of oxygen during the blast producing most violent combustion of the material in the converter, I have found no "burnt iron" during the early or middle stages of the blow. This only appears at quite the latter stages, when the carbon is nearly all burnt out. At the termination of the blow, the material left in the converter is burnt iron of a very exaggerated type in all cases where the burning out of the carbon has been carried to its full extent.

Mr. Bessemer failed in his attempts to produce malleable iron by this process, and all subsequent attempts have equally failed, even when the very finest qualities of hæmatite pig-iron have been used. I am not aware that any explanation of this has yet been given, but have no doubt that it depends upon the principle above stated, viz., that some combined carbon is absolutely necessary to prevent the iron from oxidation, and thus, as the carbon is removed, the iron begins to oxidize throughout, and we have an incoherent mixture of iron and particles of oxides, which crushes under the hammer or the rolls, is neither malleable nor ductile.

The degree of rottenness depends upon the extent to which the blow has been carried, and the iron thus produced varies from a quality which simply cracks at the edges when hammered or rolled, to a mass that crushes into granules like a piece of coarse sandstone. If inattention or some hitch in the machinery prevents the immediate turning over of the converter, and the blow is continued a few minutes too long, the amount of oxidation is so considerable that the mass in the converter looses its fluidity, and becomes a spongy and pasty mixture of melted iron and infusible oxide, which is rather troublesome to the manufacturer.

By the simple method described in the paper above referred to I have been enabled at once to detect the presence of entangled particles of oxide in the midst of the iron remaining in the converter at the end of the blow. They are even visible on the fracture of overblown iron.

The presence of this free oxide explains some otherwise inexplicable phenomena which accompany the pouring of the spiegeleisen. A furious ebullition of the molten metal takes place, jets of burning carbonic oxide spurt up violently from all parts of the surface; the converter is filled with the blue flame which pours forth from its mouth, producing the weird illumination I have already described. The outpouring flame so completely occupies the whole dimensions of the mouth of the converter, that no air can possibly enter, and thus all the oxygen required for the combustion which is going on must be derived from the material inside the converter. Some of the carbon of the spiegeleisen is thus burning at the expense of the oxide of the original charge, and this oxide is thereby reduced.

The sole function usually attributed to the spiegeleisen is that of converting the iron into steel; but if the above be correct, it performs, in addition to this, the important service of reducing the free oxide of the rotten burnt iron, and thereby rendering it malleable. We shall now understand why Mr. Bessemer and others have failed to produce malleable iron by directly oxidizing the silicon, carbon, etc., of the pig-iron in the converter. It may be asked how then does the puddler remove the carbon from pig-iron? My answer is simply that he does it by a far less violent process of oxidation; that towards the end of his work when the iron is "coming to nature," *i. e.*, when the proportion of protecting carbon has become very small, he takes especial precautions by closing the dampers, and otherwise diminishes the rate of oxidation as much as possible, and thus he is able to work down to less than 1-10 per cent. of carbon without burning his iron.

The more violent oxidizing agency of the Bessemer blast demands a greater quantity of carbon for the protection of the iron, and accordingly it is found that about 0.25 per cent. is the minimum limit of carbon which is practically obtainable without sacrifice of malleability. I have determined the carbon of many hundreds of samples of Bessemer steel which has been specially made as "mild" as possible, where it was a primary object to reach the minimum proportion of carbon, and have never found any sound metal to contain less than 0.20 per cent. The usual range of this (which is sometimes called "Bessemer metal," being scarcely steel, although not true iron) is from 0.25 to 0.30 per cent. of carbon. I do not here speak of the limits of absolute possibility, but of the practical limits of the process as at present conducted.

I should add that, in the course of subsequent working the proportion of carbon is reduced, but the extent of this reduction is very variable, depending on the number of reheatings, the amount of surface exposed, and the kind of furnace in which the reheating is conducted. By using a reducing flame the oxidation of the carbon may be wholly prevented, but in the ordinary reheating or mill furnace, and in the exposure of rolling, etc., a certain amount of oxidation commonly occurs. Rails and tires usually contain two or three hundredths per cent. less than the ingots from which they were made; thin plates and sheets lose a larger proportion, even as much as one-tenth per cent. in extreme instances. I have removed the whole of the carbon from the surface of a hard steel plate by exposing it for several days to the low red heat of an annealing furnace.—*Nature.*

PUBLISHER'S ANNOUNCEMENTS.

The Roadmaster's Assistant & Section-Master's Guide.

This new book is received with great favor by the general officers of railroad companies and the employes to whom it is addressed, as well as by the engineering profession. We present a few extracts from the many commendations it has received:

"I consider it a most valuable 'Assistant' to any one connected with or interested in the track department of a railroad, and shall see that each of my section foremen and roadway operating employes is supplied with the book."—*W. F. Downs, General Superintendent, Central Branch Union Pacific Railroad.*

"This is a timely and useful little treatise; one which, as a practical guide, leaves little to be desired. It should be carried in the pocket of every road and section-master in the country."—*Scientific American.*

"The tight and tiny little volume is crammed with the most useful of reference for everybody having any working connection with our American railroads."—*Chicago Times.*

"The chapters on spikes and the treatment of rails, previous to and during the operation of laying the track, contain many hints which alone are worth many times the cost of the book."—*Engineering and Mining Journal.*